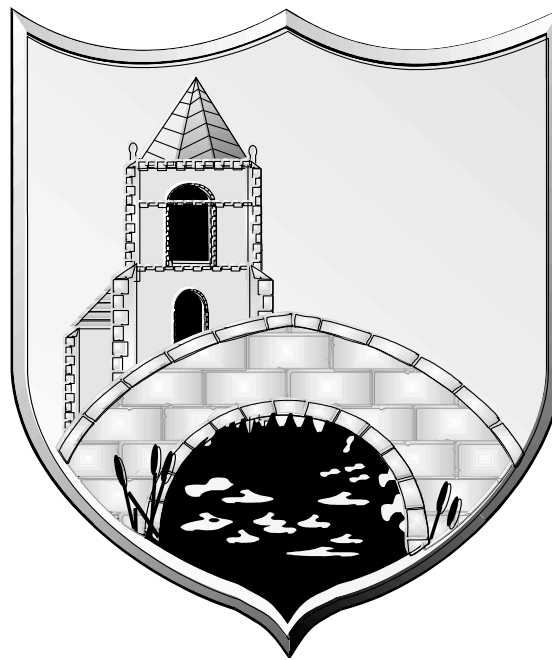


# Farcet C. of E. Primary School



## Calculation Policy

### Math of Life

**Add** Jesus to your Life (Romans 10: 9-10)

**Multiply** your good deeds (2 Corinthians 10:8)

**Divide** your blessings with others (2 Corinthians 9:11) and

**Subtract** all your fears (1 Peter 5:7)

**Equals** a wonderful Life (Psalm 16:11)

### **The Rationale:**

Our core belief is that all children have the potential to succeed in all areas of Mathematics. They should have the same curriculum content and, rather than be extended with new learning should be challenged to deeper their conceptual understanding through variation. Children will be able to demonstrate and explain their understanding through a CPA (Concrete, Pictorial, Abstract) approach.

We believe that children should be introduced to the processes of calculation through practical, oral and mental activities. As children begin to have a firm foundation of number sense, they then develop ways of recording to support their thinking through abstract and traditional methods of calculation. Pupils should be able to identify correct operation(s) to solve a given problem. They should be able to establish known and unknown quantities and identify the relationship between them using their inverse knowledge to support this. They then should be able to represent these known and unknown values as a part or a whole in the problem. This will be supported through part-whole models and bar models.

Written methods are complementary to mental methods and should not be seen as separate from them. Children will learn variety strategies so they are able to choose the most efficient strategy. By the end of Year 6 children should be able to choose the most appropriate method to solve a problem: making a choice between using jottings (an extended written method), an efficient written method or a mental method.

### **Purpose:**

The purpose of the Calculation Policy is to provide a systematic approach to methods and to make teachers of the strategies used in each group, as well as supporting teachers to choose the right CPA method for their year group. It only details strategies and teachers must plan opportunities for children to apply these, using White Rose Maths, nRich, Ncetm, Classroom Secrets, I see Reasoning, Deepening Understanding, Convince me Cards. The CP representatives are examples and not exhaustive.

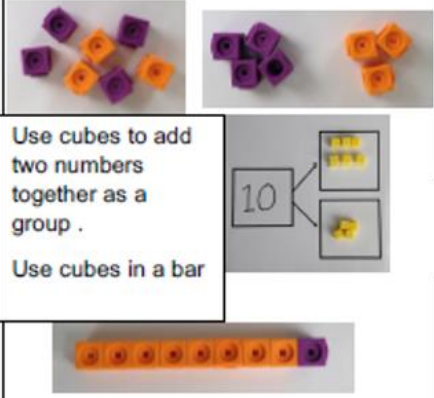
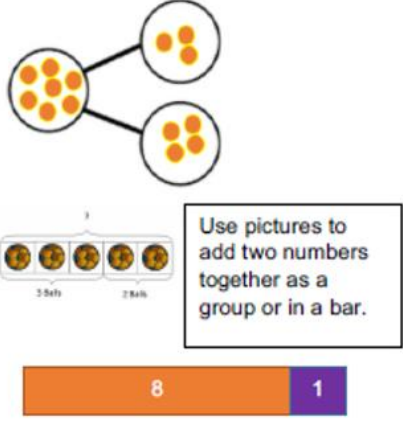
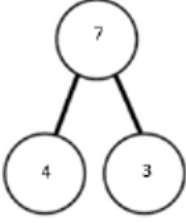
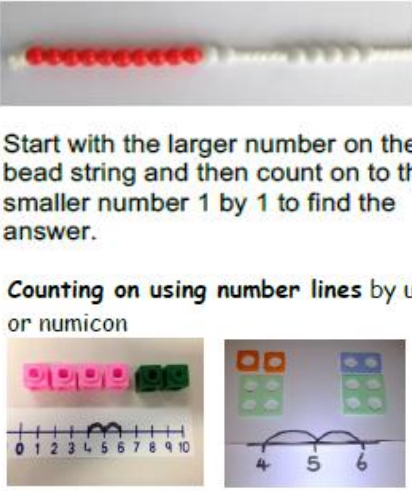
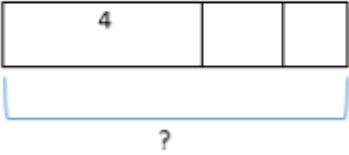
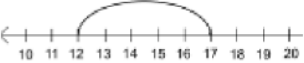
### **Mathematical Language:**

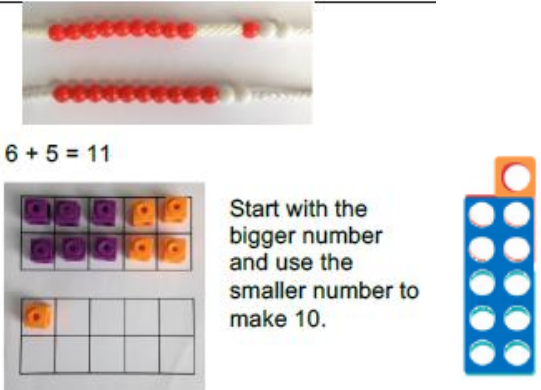
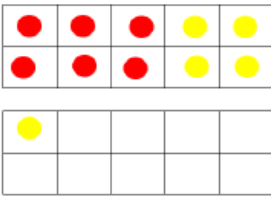
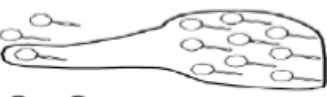
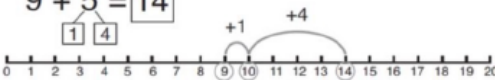
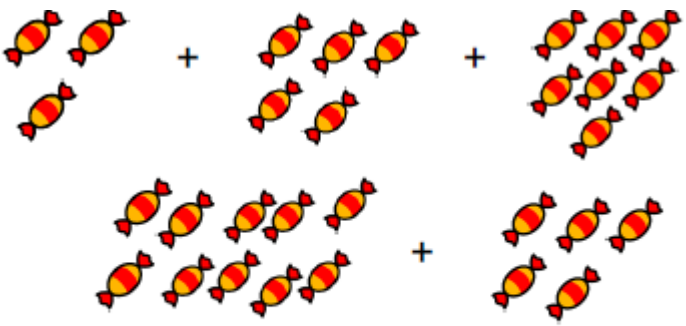
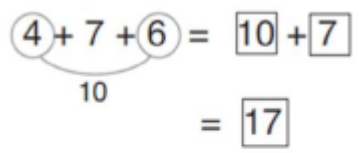
The 20104 National Curriculum is explicit in articulating the importance of pupils using correct mathematical language as a central part of their learning. High expectations of the mathematical language used are essential, with teachers modelling accurate mathematical vocabulary and expecting pupils' responses to include it in full sentences. Language will be displayed in classrooms.

**This document identifies progression in calculations strategies. This policy contains the key pencil and paper procedures that will be taught within our school alongside practical and pictorial resources. It has been written to ensure consistency and progression throughout the school and reflects a whole school agreement.**

# Addition

The skills and methods taught are linked to National Curriculum and ordered in sequence of progression.

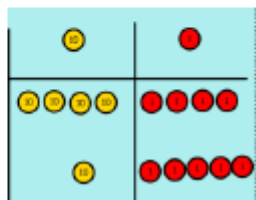
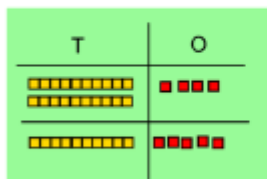
| Objective and strategies                                    | Concrete                                                                                                                                                                                                                                                                     | Pictorial                                                                                                                                                  | Abstract                                                                                                                                                                                                                          |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Combining two parts to make a whole (Part-part whole model) |  <p>Use cubes to add two numbers together as a group .</p> <p>Use cubes in a bar</p>                                                                                                        |  <p>Use pictures to add two numbers together as a group or in a bar.</p> | <p><math>4 + 3 = 7</math> (four is a part, 3 is a part and the whole is seven)</p>                                                             |
| Starting at the bigger number and counting on               |  <p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p> <p>Counting on using number lines by using cubes or numicon</p> | <p>A bar model which encourages the children to count on</p>            | <p><math>12 + 5 = 17</math></p>  <p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p> |

|                                                                                                                                         |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Regrouping to make 10. Adding three single digits.</p> <p>Children look for near doubles or number bonds and add together first.</p> |  <p><math>6 + 5 = 11</math></p> <p>Start with the bigger number and use the smaller number to make 10.</p>                                                                                         | <p>Children to draw the ten frame and counters/cubes</p>   <p><math>3 + 9 =</math></p> <p>Use pictures or a number line. Regroup or partition the smaller number to make 10.</p> | <p><math>9 + 5 = 14</math></p>  <p><math>7 + 4 = 11</math></p> <p>If I am at seven, how many more do I need to make 10. How many more do I add on now?</p> |
| <p>Adding three single digits.</p> <p>Children look for near doubles or number bonds and add together first.</p>                        | <p><math>4 + 7 + 6 = 17</math></p> <p>Put 4 and 6 together to make 10. Add on 7.</p>  <p>Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.</p> |  <p>Add together three groups of objects. Draw a picture to recombine the groups to make 10.</p>                                                                                                                                                                  | <p><math>4 + 7 + 6 = 10 + 7 = 17</math></p>  <p>Combine the two numbers that make 10 and then add on the remainder.</p>                                    |

Column method- no regrouping

$$24 + 15 =$$

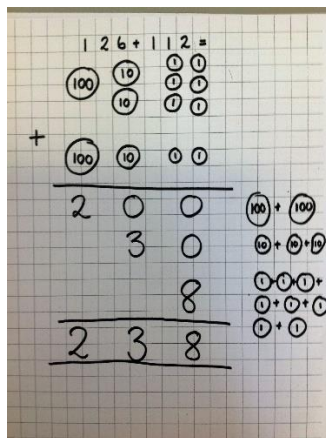
Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.



$$\begin{array}{r} 20 + 4 \\ 10 + 5 \\ \hline 30 + 9 = 39 \end{array}$$

$$\begin{array}{r} 40 + 4 \\ 10 + 5 \\ \hline 30 + 9 = 39 \end{array}$$

After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.

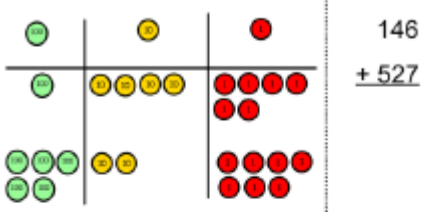
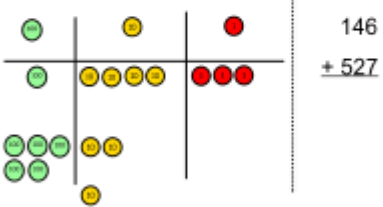
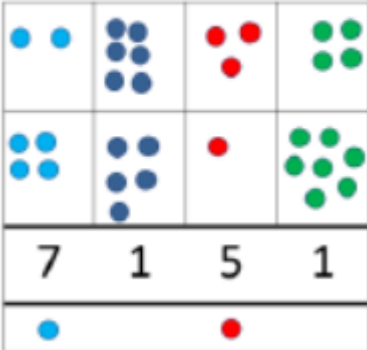


$$\begin{array}{r} 20 + 1 \\ 40 + 2 \\ \hline 60 + 3 = 63 \end{array}$$

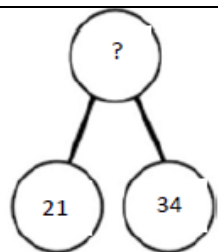
Calculations

$$21 + 42 =$$

$$\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$$

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Column Method<br/>Regrouping</p> | <p>Make both numbers on a place value grid.</p>  <p>146<br/>+ 527</p> <p>Add up the units and exchange 10 ones for one 10.</p>  <p>146<br/>+ 527</p> <p>Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.</p> <p>This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100. As children move on to decimals, money and decimal place value counters can be used to support learning.</p> | <p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.</p>  | <p>Start by partitioning the numbers before moving on to clearly show the exchange below the addition.</p> $\begin{array}{r} 20 + 5 \\ 40 + 8 \\ 60 + 13 = 73 \end{array}$ <p>As the children move on, introduce decimals with the same number of decimal places and different. Money can be</p> $\begin{array}{r} 536 \\ + 85 \\ \hline 621 \end{array}$ <p>11</p> $\begin{array}{r} 23.361 \\ 9.080 \\ \hline 59.771 \\ + 1.000 \\ \hline 60.771 \end{array}$ <p>£ 23.361 + £ 9.080 = £ 32.441</p> |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# Fluency variation, different ways to ask children to solve 21+34:



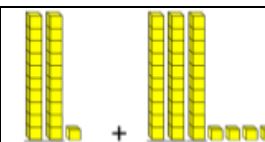
Sam saved £21 one week and £34 another.  
How much did he save in total?  
 $21+34=55$ . Prove it! (reasoning but the children need to be fluent in representing this)

$$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$$

$$21 + 34 =$$

$$\square = 21 + 34$$

What's the sum of twenty one and thirty four?

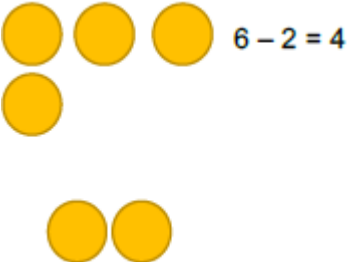
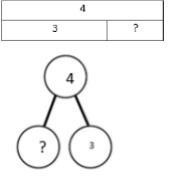


Always use missing digit problems too:

| Tens  | Ones |
|-------|------|
| ● ●   | ●    |
| ● ● ● | ?    |
| ?     | 4    |

# Subtraction

The skills and methods taught are linked to National Curriculum and ordered in sequence of progression.

| Objective and strategies                                                                                                                                          | Concrete                                                                                                                                                                                                                                                                                   | Pictorial                                                                                                                                                                                                                                                                                                                                                           | Abstract                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Physically taking away and removing objects from a whole</b><br>(use various objects too) rather than crossing out-children will physically remove the objects | <p><math>4 - 3 = 1</math></p>  <p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  | <p>Children to draw the concrete resources they are using and cross out.</p>  <p>Use of the bar model:</p>   | <p><math>4 - 3 =</math></p> <p><math>\square = 4 - 3</math></p>  |

## Counting back

Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.

$$13 - 4$$



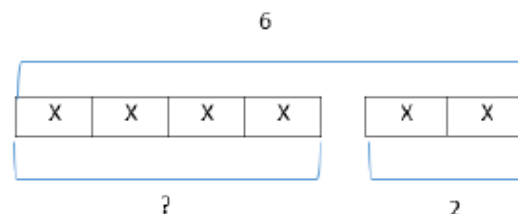
Use counters and move them away from the group as you take them away counting backwards as you go.



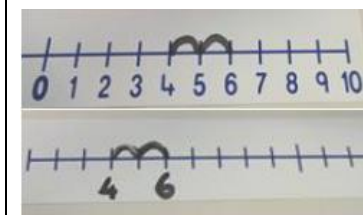
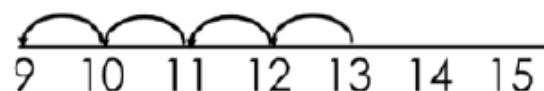
**Counting back** (using number lines or number tracks)



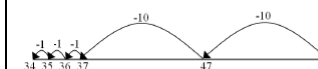
Children to represent what they see pictorially e.g.



Count back on a number line or number track

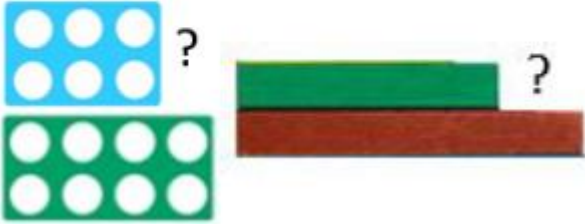
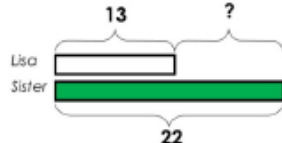
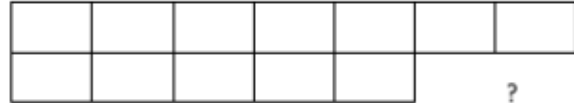
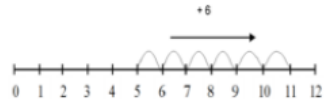
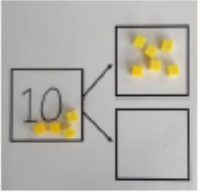
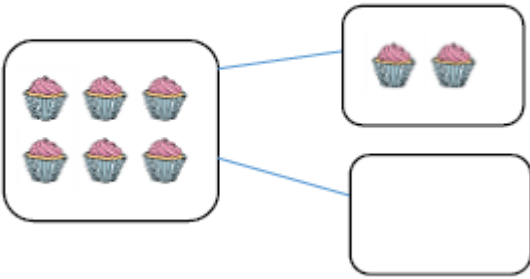


Start at the bigger number and count back the smaller number showing the jumps on the number line.



This can progress all the way to counting back using two 2 digit numbers.

Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

|                                                          |                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Find the difference</p>                               | <p><b>Finding the difference</b> (using cubes, numicon or Cuisenaire rods, other objects can also be used)</p> <br>                        | <p><b>Comparison Bar Models</b></p> <p>Draw bars to find the difference between 2 numbers.</p> <p>Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.</p> <br><p>Children to draw the cubes/other concrete objects which they have used</p> <p>XXXXXXXXXX<br/>XXXXXXX</p><br><p>Use of the bar model</p>  |  <p>Find the difference between 8 and 6.<br/>8 - 6, the difference is ?</p> <p>Children to also explore why 9 - 7 = 8 - 6 (the difference, of each digit, has changed by 1 do the difference is the same- this will help when solving 10000-9987)</p> |
| <p>Part -Part Whole Model – linked back to addition.</p> |  <p>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.</p> <p>If 10 is the whole and 6 is one of the parts. What is the other part?</p> <p><math>10 - 6 =</math></p> | <p>Use a pictorial representation of objects to show the part part whole model.</p>                                                                                                                                                                                                                                                                                                                                               |  <p>Move to using numbers within the part whole model.</p>                                                                                                                                                                                          |

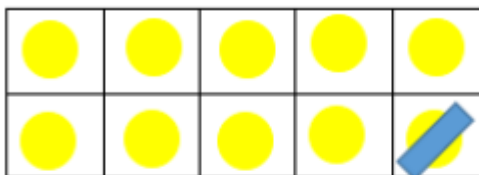
Make 10

$$14 - 9 =$$



Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.

Children to present the ten frame pictorially



$14 - 5 = 9$  You also want children to see related facts e.g.  $15 - 9 = 5$

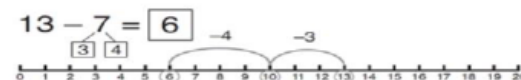
Children to represent how they have solved it e.g.

$$\begin{array}{c} 14 - 5 = 9 \\ \swarrow \quad \searrow \\ 5 \quad \quad 5 \end{array}$$

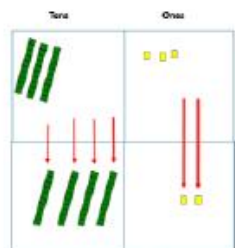
14 is made up of 5, 5 and 4 so I can subtract one 5 to be left with 4 and 5

$$\begin{array}{c} 14 - 5 = 9 \\ \swarrow \quad \searrow \\ 4 \quad \quad 1 \end{array}$$

5 is made up of 4 and 1 so I can subtract 4 to make 10 and then 1 to get to 9

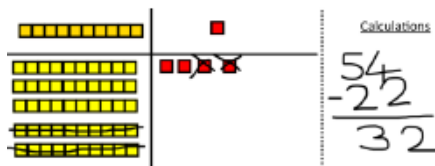


Column method without regrouping



Use Base 10 to make the bigger number then take the smaller number away.

Show how you partition numbers to subtract. Again make the larger



Calculations

$$\begin{array}{r} 54 \\ - 22 \\ \hline 32 \end{array}$$

Draw the Base 10 or place value counters alongside the written calculation to help to show working.



$$\begin{array}{r} 47 - 24 = 23 \\ \underline{40 + 7} \\ - \underline{20 + 4} \\ 20 + 3 \end{array}$$

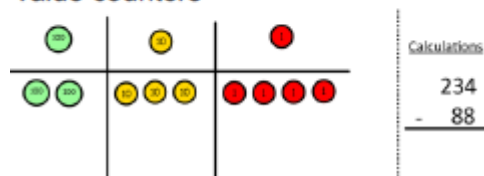
This will lead to a clear written column subtraction.

$$\begin{array}{r} 32 \\ - 12 \\ \hline 20 \end{array}$$

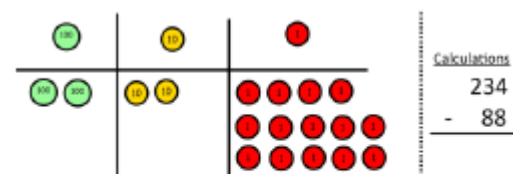
Column method with regrouping and replacing.

Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

Make the larger number with the place value counters

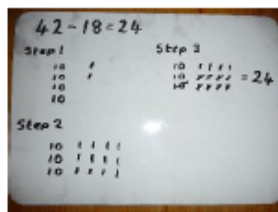


Start with the ones, can I take away 8 from 4 easily? I need to exchange and replace one of my tens for ten ones.



Now I can subtract my ones.

Now look at the tens, can I take away 8 tens easily? I need to exchange and replace one hundred for ten tens.

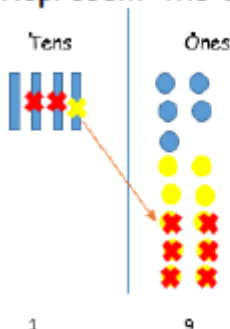


When confident, children can find their own way to record the exchange/regrouping.

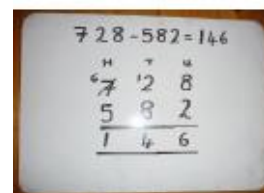
Just writing the numbers as shown here shows that the child understands the method

and knows when to exchange/regroup.

Represent the base 10 pictorially



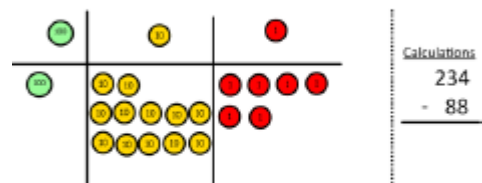
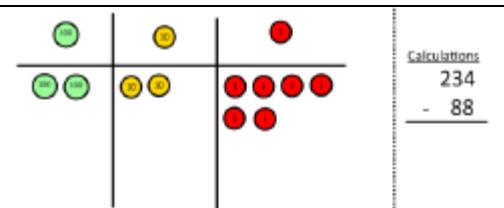
Children can start their formal written method by partitioning the number into clear place value columns.



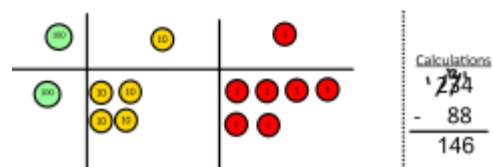
Moving forward the children use a more compact method.

This will lead to an understanding of subtracting any number including decimals.

$$\begin{array}{r} \begin{array}{ccc} 5 & 12 & 1 \\ 2 & 6 & 3 \\ - & 2 & 6 \\ \hline 2 & 3 & 6 \end{array} \end{array}$$

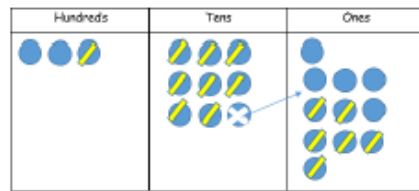


Now I can take away eight tens and complete my subtraction



Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and replacing and show where we write our new amount.

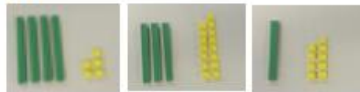
What's the calculation? What's the answer?



$$\begin{array}{r} 39\Box \\ - \Box\Box6 \\ \hline \Box05 \end{array}$$

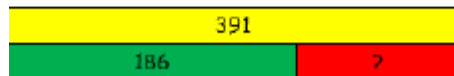
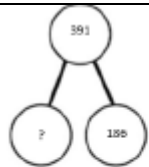
**Column method** (using base 10 and having to exchange)

45-26



- 1) Start by partitioning 45
- 2) Exchange one ten for ten more ones
- 3) Subtract the ones, then the tens.

## Fluency variation, different ways to ask children to solve 391-186:



Raj spent £391, Timmy spent £186. How much more did Raj spend?

I had 391 metres to run. After 186 I stopped. How many metres do I have left to run?

$$391 - 186$$

$$\Box = 391 - 186$$

391

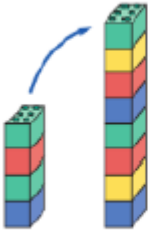
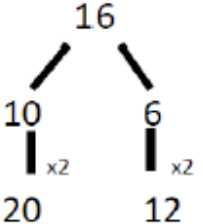
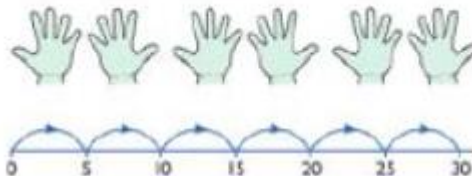
-186

—

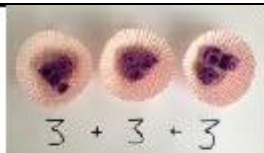
Find the difference between 391 and 186  
Subtract 186 from 391.  
What is 186 less than 391?

# Multiplication

The skills and methods taught are linked to National Curriculum and ordered in sequence of progression.

| Objective and strategies | Concrete                                                                                                                                                                                                                                       | Pictorial                                                                                                                                                              | Abstract                                                                                                                                                                     |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Doubling                 | <p>Use practical activities to show how to double a number.</p>  <p>double 4 is 8<br/><math>4 \times 2 = 8</math></p>                                         | <p>Draw pictures to show how to double a number.</p> <p>Double 4 is 8</p>            |  <p>Partition a number and then double each part before recombining it back together.</p> |
| Counting in multiples    |   <p>Count in multiples supported by concrete objects in equal groups.</p> |  <p>Use a number line or pictures to continue support in counting in multiples.</p> | <p>Count in multiples of a number aloud.<br/>Write sequences with multiples of numbers.<br/>2, 4, 6, 8, 10<br/>5, 10, 15, 20, 25, 30</p> <p>Games used to practice.</p>      |

Repeated addition

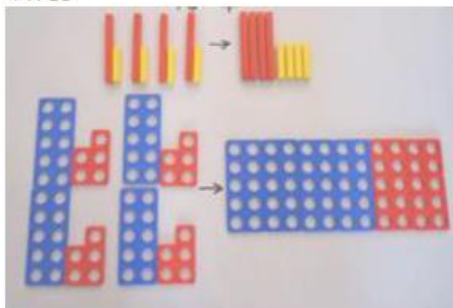


Use different objects to add equal groups.

**Repeated grouping/repeated addition**  
(does not have to be restricted to cubes)  
 $3 \times 4$  or 3 lots of 4



$4 \times 15$



Use  
Use this in Year 2 greater depth or KS2 for extra support.

There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?



2 add 2 add 2 equals 6



$2 + 2 + 2 + 2 + 2 = 10$

Use of a bar model for a more structured method

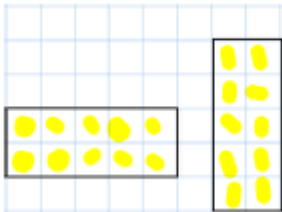
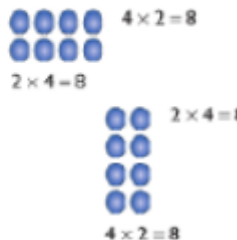
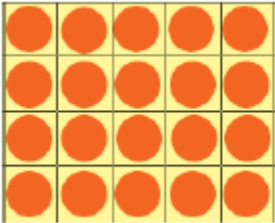


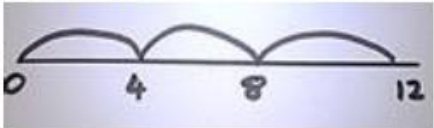
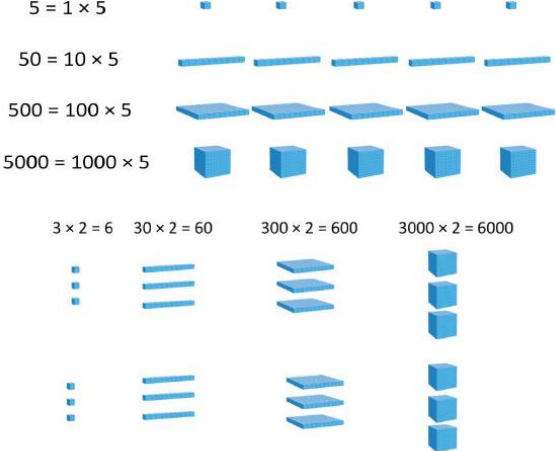
Write addition sentences to describe objects and pictures.

$3 \times 4$

$4 + 4 + 4$

|    |   |   |
|----|---|---|
| 12 |   |   |
| 4  | 4 | 4 |

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Use arrays to illustrate commutativity</p> | <p>(counters and other objects can also be used)</p> $2 \times 5 = 5 \times 2$  <p>Create arrays using counters/ cubes to show multiplication sentences.</p>   | <p>Children to draw the arrays</p>  <p>Draw arrays in different rotations to find <b>commutative</b> multiplication sentences.</p>   <p>Link arrays to area of rectangle</p> | <p>Children to be able to use an array to write a range of calculations e.g.</p> $2 \times 5 = 10$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $5 + 5 = 10$ <p>Use an array to write multiplication sentences and reinforce repeated addition.</p>  $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$ |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                   |                                                                                                                                                                                           |  |  |  |  |  |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|
| <p>Use number lines to show repeated groups.</p>                                                                                                                                                                                                                                                                                         | <p><b>Use number lines to show repeated groups- <math>3 \times 4</math></b></p>                                                                                                                                                                                                                   | <p>Represent this pictorially alongside a number line e.g:</p>  | <p>Abstract number line<br/><math>3 \times 4 = 12</math></p>                                           |  |  |  |  |  |  |  |  |
| <p>Using known facts for multiplying by multiples of 10, 100 and 1000<br/><i>Pupils' growing understanding of place value, allows them to make use of known facts to derive multiplications using powers of 10.</i><br/><i>It is important to use tables with which they are already familiar (i.e. not 7 or 9 tables in Year 3)</i></p> | <p><math>5 = 1 \times 5</math></p> <p><math>50 = 10 \times 5</math></p> <p><math>500 = 100 \times 5</math></p> <p><math>5000 = 1000 \times 5</math></p> <p><math>3 \times 2 = 6</math>   <math>30 \times 2 = 60</math>   <math>300 \times 2 = 600</math>   <math>3000 \times 2 = 6000</math></p>  |                                                                                                                                                   | <p><math>360 \div 10 =</math></p> <table border="1" data-bbox="1541 580 2107 667"> <tr> <td></td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td></tr> </table> |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                   |                                                                                                                                                                                           |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                   |                                                                                                                                                                                           |  |  |  |  |  |  |  |  |

# Grid Method

Show the link with arrays to first introduce the grid method.

|   |                                                                                   |                                                                                   |
|---|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| x | 10                                                                                | 3                                                                                 |
| 4 |  |  |

4 rows of 10  
4 rows of 3

Move on to using Base 10 to move towards a more compact method.

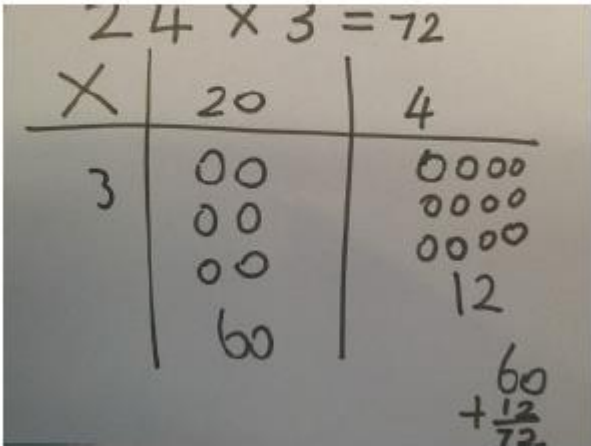
|   |                                                                                   |                                                                                   |
|---|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| x | T                                                                                 | U                                                                                 |
|   |  |  |

4 rows of 13

Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.

Children can represent the work they have done with place value counters in a way that they understand.

They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.



Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

|   |     |    |
|---|-----|----|
| x | 30  | 5  |
| 7 | 210 | 35 |

210 + 35 = 245

Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

|    |     |    |
|----|-----|----|
|    | 10  | 8  |
| 10 | 100 | 80 |
| 3  | 30  | 24 |

|    |       |      |     |    |
|----|-------|------|-----|----|
| x  | 1000  | 300  | 40  | 2  |
| 10 | 10000 | 3000 | 400 | 20 |
| 8  | 8000  | 2400 | 320 | 16 |

Short  
Column  
Multiplication

Calculus

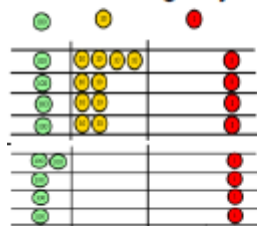
$4 \times 126$

Fill each row with 126.

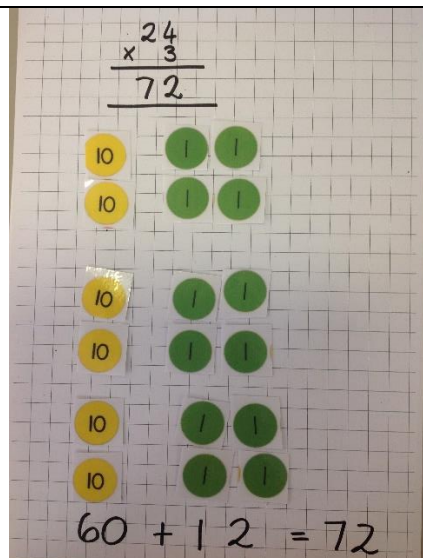


Calculations  
4 x 126

Add up each column, starting with the ones making any exchanges needed.



Then you have  
your answer.



Children to record what it is they are doing to show understanding

$$\begin{array}{r} 3 \times 23 \\ \swarrow \searrow \\ 20 \quad 3 \end{array} \quad \begin{array}{l} 3 \times 20 = 60 \\ 3 \times 3 = 9 \\ 60 + 9 = 69 \end{array}$$

$$\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

|                                   |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Long Column Multiplication</p> |  |  | <p>Start with long multiplication, reminding the children about lining up their numbers clearly in columns.</p> <p>If it helps, children can write out what they are solving next to their answer.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <math display="block">  \begin{array}{r}  32 \\  \times 24 \\  \hline  8 \quad (4 \times 2) \\  120 \quad (4 \times 30) \\  40 \quad (20 \times 2) \\  600 \quad (20 \times 30) \\  \hline  768  \end{array}  </math> </div> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <math display="block">  \begin{array}{r}  74 \\  \times 63 \\  \hline  12 \\  210 \\  240 \\  + 4200 \\  \hline  4662  \end{array}  </math> <p>This moves to the more compact</p> <math display="block">  \begin{array}{r}  231 \\  1342 \\  \times 18 \\  \hline  13420 \\  10736 \\  \hline  24156  \end{array}  </math> <p>method.</p> </div> |
|-----------------------------------|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# Fluency variation, different ways to ask children to solve $6 \times 23$ :

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 23 | 23 | 23 | 23 | 23 | 23 |
|----|----|----|----|----|----|

?

With the counters, prove that  $6 \times 23 = 138$

Why is  $6 \times 23 = 32 \times 6$ ?

Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week?

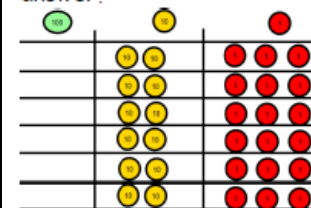
Tom saved 23p three days a week. How much did he save in 2 weeks?

Find the product of 6 and 23

$$6 \times 23 =$$

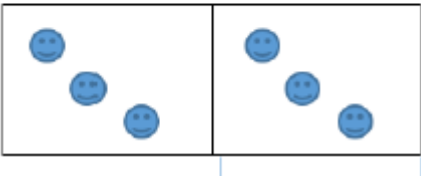
$$\begin{array}{r} \square = 6 \times 23 \\ 6 \quad 23 \\ \times 23 \quad \times 6 \\ \hline \end{array}$$

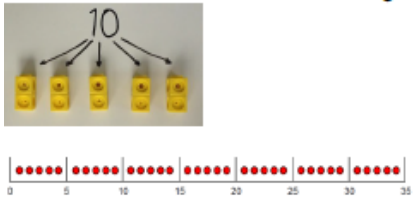
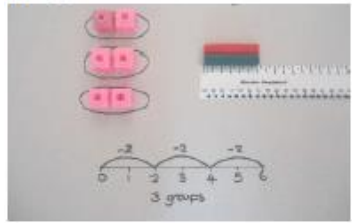
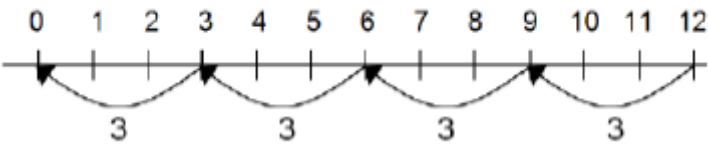
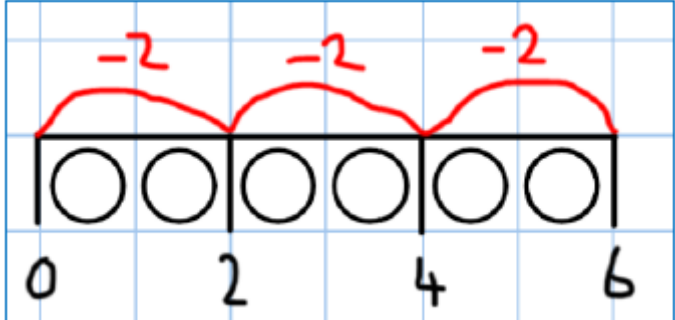
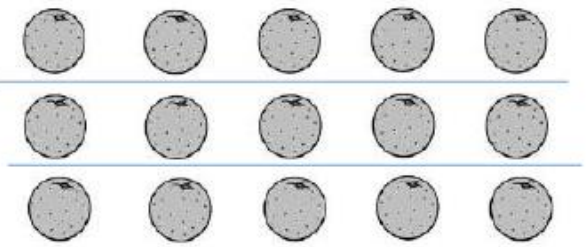
What's the calculation? What's the answer?

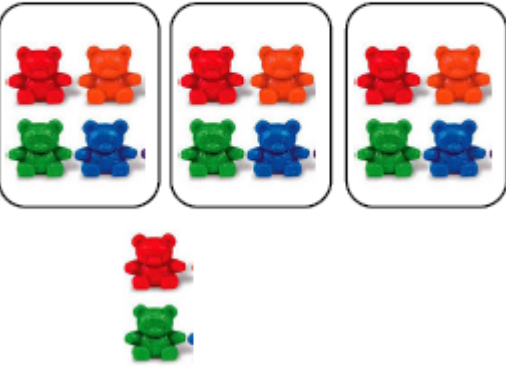
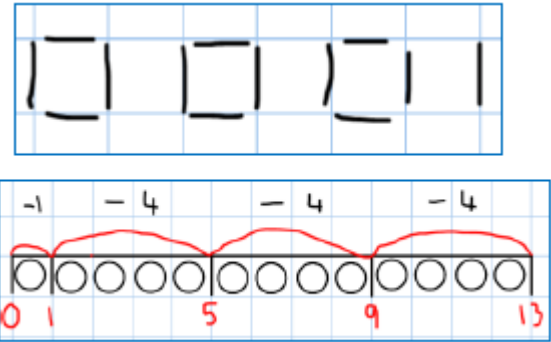


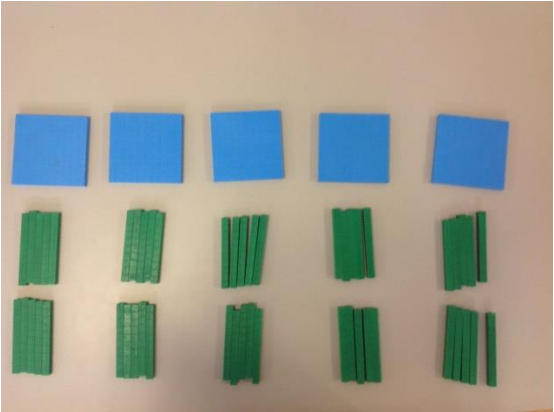
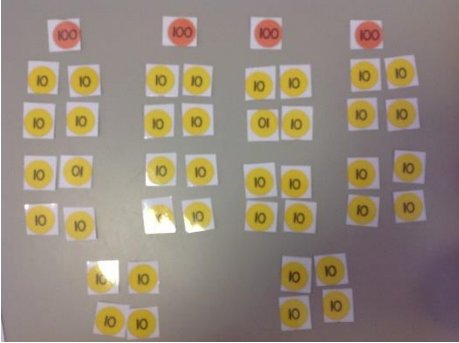
# Division

The skills and methods taught are linked to National Curriculum and ordered in sequence of progression.

| Objective and strategies    | Concrete                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Pictorial                                                                                                                                                                                                                                                                                  | Abstract                                                                                                                               |   |   |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---|---|
| Sharing objects into groups | <div></div> <div></div> <div><p>I have 10 cubes, can you share them equally in 2 groups?</p></div> <div><p>6 shared between 2 (other concrete objects can also be used e.g. children and hoops, teddy bears, cakes and plates)</p></div> <div></div> | <div></div> <div><p>This can also be done in a bar so all 4 operations have a similar structure:</p></div> <div></div> | <div><math>6 \div 2 = 3</math></div> <div><p>What's the calculation?</p></div> <div><table><tr><td>3</td><td>3</td></tr></table></div> | 3 | 3 |
| 3                           | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                            |                                                                                                                                        |   |   |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                   |    |  |  |  |   |   |   |   |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--|--|--|---|---|---|---|
| <p>Division as grouping and repeated subtraction.</p>           | <p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>  <p><math>96 \div 3 = 32</math></p>  <p>Understand division as repeated grouping and subtracting</p> <p><math>6 \div 2</math></p>  | <p>Use a number line to show jumps in groups. The number of jumps equals the number of groups.</p>   | <p><math>28 \div 7 = 4</math></p> <p>Divide 28 into groups of 7. How many are in each group?</p> <table border="1" data-bbox="1644 279 2060 359"> <tr> <td colspan="4">28</td></tr> <tr> <td>7</td><td>7</td><td>7</td><td>7</td></tr> </table>   | 28 |  |  |  | 7 | 7 | 7 | 7 |
| 28                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                   |    |  |  |  |   |   |   |   |
| 7                                                               | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 7                                                                                                                                                                                                                                                                        | 7                                                                                                                                                                                                                                                 |    |  |  |  |   |   |   |   |
| <p>Division with arrays including fact families and inverse</p> |  <p>Link division to multiplication by creating an array and thinking about the number sentences that can be created.</p> <p>Eg <math>15 \div 3 = 5</math>    <math>5 \times 3 = 15</math><br/> <math>15 \div 5 = 3</math>    <math>3 \times 5 = 15</math></p>                                                                                                                                                             |  <p>Draw an array and use lines to split the array into groups to make multiplication and division sentences.</p>                                                                     | <p>Find the inverse of multiplication and division sentences by creating four linking number sentences.</p> <p><math>7 \times 4 = 28</math><br/> <math>4 \times 7 = 28</math><br/> <math>28 \div 7 = 4</math><br/> <math>28 \div 4 = 7</math></p> |    |  |  |  |   |   |   |   |

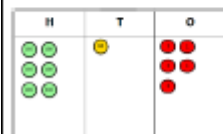
|                                          |                                                                                                                                                                                                                                                                                                                      |                                                                                    |                                                                                                                         |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <p>Division<br/>with a<br/>remainder</p> | <p>Use of lollipop sticks to form wholes</p>  <p><math>14 \div 3 =</math><br/>Divide objects between groups and<br/>see how much is left over</p>  |  | <p><math>13 \div 4 = 3r1</math></p>  |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|

|                                                                        |                                                                                                                                                             |                                                                                                                                                                                                                                                     |  |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>Using known facts for dividing by multiples of 10, 100 and 1000</p> | <p><math>500 \div 10</math></p> <p>Show using deans - showing 50 ten.</p>  | <p><math>400 \div 10 =</math></p> <p>Show sharing PV counters into groups</p>  <p><math>27 \div 10 =</math></p> <p>Show with PV counters sharing into groups.</p> |  |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

Short  
division

Use of the 'bus stop method' using grouping and counters. Key language for grouping- how many groups of X can we make with X hundreds'- *this can also be done using sharing!*

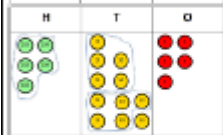
$$615 \div 5$$



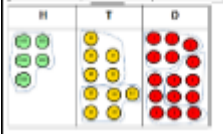
Step 1: make 615



Step 2: Circle your groups of 5



Step 3: Exchange 1H for 10T and circle groups of 5

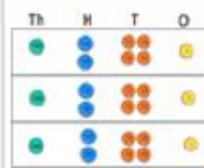


Step 4: exchange 1T for 10ones and circles groups of 5

$$3 \overline{) 3486}$$



$$3 \overline{) 3723}$$



$$3 \overline{) 3849}$$



$$5 \overline{) 123} \begin{matrix} 1 & 1 & 1 \\ 2 & 3 & 5 \end{matrix}$$

Long division



$$\begin{array}{r} 0212 \\ 12 \overline{)2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 24 \phantom{00} \\ \underline{24} \phantom{00} \\ 0 \end{array}$$

$2544 \div 12$   
How many groups of 12 thousands do we have? None



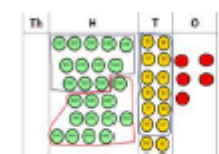
Exchange 2 thousand for 20 hundreds.



$$\begin{array}{r} 02 \\ 12 \overline{)2544} \\ \underline{24} \phantom{00} \\ 1 \phantom{00} \end{array}$$

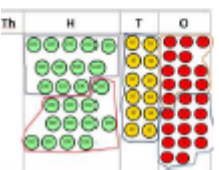
How many groups of 12 are in 25 hundreds? 2 groups. Circle them.

We have grouped 24 hundreds so can take them off and we are left with one.



$$\begin{array}{r} 021 \\ 12 \overline{)2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 2 \phantom{00} \end{array}$$

Exchange the one hundred for ten tens so now we have 14 tens. How many groups of 12 are in 14? 1 remainder 2.



Exchange the two tens for twenty ones so now we have 24 ones. How many groups of 12 are in 24? 2

Children to represent the counters, pictorially and record the subtractions beneath.

$$\begin{array}{r} 0 \\ 12 \overline{)2544} \end{array}$$

Step one- exchange 2 thousand for 20 hundreds so we now have 25 hundreds.

$$\begin{array}{r} 02 \\ 12 \overline{)2544} \\ \underline{24} \phantom{00} \\ 1 \phantom{00} \end{array}$$

Step two- How many groups of 12 can I make with 25 hundreds? The 24 shows the hundreds we have grouped. The one is how many hundreds we have left.

$$\begin{array}{r} 021 \\ 12 \overline{)2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 2 \phantom{00} \end{array}$$

Exchange the one hundred for 10 tens. How many groups of 12 can I make with 14 tens?

The 14 shows how many tens I have, the 12 is how many I grouped and the 2 is how many tens I have left.

$$\begin{array}{r} 0212 \\ 12 \overline{)2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 24 \phantom{00} \\ \underline{24} \phantom{00} \\ 0 \end{array}$$

Exchange the 2 tens for 20 ones. The 24 is how many ones I have grouped and the 0 is what I have left.

# Fluency variation, different ways to ask children to solve $615 \div 5$ :

Using the part whole model below, how can you divide 615 by 5 without using the 'bus stop' method?



I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

$$5 \overline{)615}$$

$$615 \div 5 =$$

$$\square = 615 \div 5$$

How many 5's go into 615?

What's the calculation? What's the answer?

