



Wenlock CE Academy Maths Calculation Policy

Rationale

This policy is based on the White Rose Maths Hub Calculation Guidance and has been adapted to suit the needs of Wenlock CE Academy. The policy outlines the progression of a Concrete, Pictorial, Abstract approach, leading to sound written methods across the four operations. Through this policy, we aim to link a variety of manipulatives and representations* in order for children to accelerate through each strand of calculation. This policy ensures consistency of approach throughout the year groups, enabling children to progress and build on representations from the previous teaching. As children are working towards the same learning objective, teachers will be presenting a variety of strategies and resources appropriate to children's level of understanding. The majority of children will be working at age appropriate expectations, as outlined in the 2014 National Curriculum, those who are not will be quickly identified and receive rapid intervention by experienced members of staff.

Purpose

The purpose of this policy is to ensure that all staff are able to deliver high quality, Mastery-based maths in order for our children to achieve to the best of their abilities. The policy will also be available to parents to help them understand the school approach to Maths, allowing them to support their children with their learning effectively

*See Appendix 2 for representations

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	<p>Combining two parts to make a whole: part whole model.</p> <p>Starting at the bigger number and counting on.</p> <p>Exchanging to make 10.</p>	<p>Adding three single digits.</p> <p>Column method - no exchanging.</p>	<p>Column method-exchanging. (up to 3 digits)</p>	<p>Column method-exchanging. (up to 4 digits)</p>	<p>Column method-exchanging. (with more than 4 digits)</p> <p>(Decimals- with the same amount of decimal places)</p>	<p>Column method-exchanging. (Decimals- with different amounts of decimal places)</p>
Subtraction	<p>Taking away ones</p> <p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10</p>	<p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10</p> <p>Column method- no exchanging</p>	<p>Column method with exchanging. (up to 3 digits)</p>	<p>Column method with exchanging. (up to 4 digits)</p>	<p>Column method with exchanging. (with more than 4 digits)</p> <p>(Decimals- with the same amount of decimal places)</p>	<p>Column method with exchanging. (Decimals- with different amounts of decimal places)</p>
Multiplication	<p>Doubling</p> <p>Counting in multiples</p> <p>Arrays (with support)</p>	<p>Doubling</p> <p>Counting in multiples</p> <p>Repeated addition</p> <p>Arrays- showing commutative multiplication</p>	<p>Counting in multiples</p> <p>Repeated addition</p> <p>Arrays- showing commutative multiplication</p> <p>Grid method</p>	<p>Column multiplication</p> <p>(2 and 3 digit multiplied by 1 digit)</p>	<p>Column multiplication</p> <p>(up to 4 digit numbers multiplied by 1 or 2 digits)</p>	<p>Column multiplication</p> <p>(multi digit up to 4 digits by a 2 digit number)</p>
Division	<p>Sharing objects into groups</p> <p>Division as grouping</p>	<p>Division as grouping</p> <p>Division within arrays</p>	<p>Division within arrays</p> <p>Division with a remainder</p> <p>Short division (2 digits by 1 digit- concrete and pictorial)</p>	<p>Division within arrays</p> <p>Division with a remainder</p> <p>Short division (up to 3 digits by 1 digit- concrete and pictorial)</p>	<p>Short division</p> <p>(up to 4 digits by a 1 digit number interpret remainders appropriately for the context)</p>	<p>Short division</p> <p>Long division</p> <p>(up to 4 digits by a 2 digit number- interpret remainders as whole numbers, fractions or round)</p>

Addition and subtraction are connected.

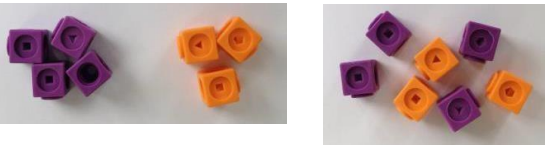
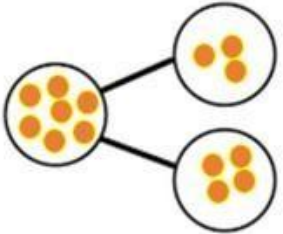
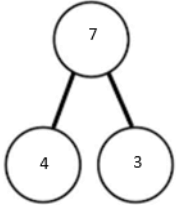
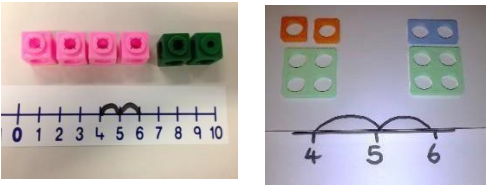
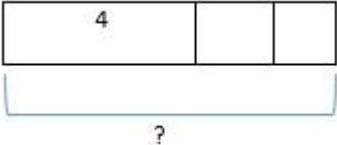
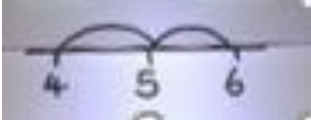
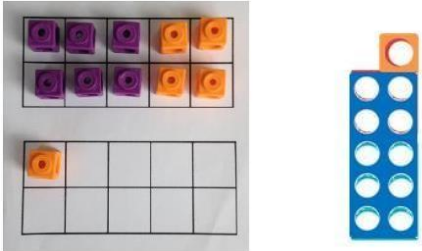
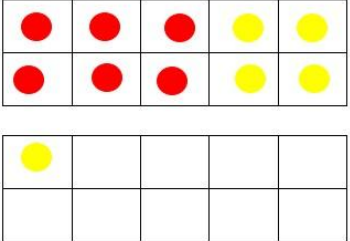
Part	Part
Whole	

Addition names the whole in terms of the parts and Subtraction names a missing part of the whole.

Addition is commutative, associative and distributive (see Appendix). Subtraction is only distributive (see Appendix).

Addition-

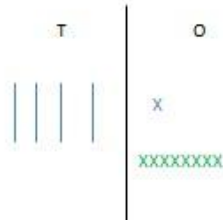
Key language which should be used: sum, total, parts and wholes, plus, add, altogether, more than, 'is equal to' 'is the same as'

Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears etc)</p> 	<p>Pictorial</p> 	<p>$4 + 3 = 7$ (four is a part, 3 is a part and the whole is seven)</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>The abstract number line: What is 2 more than 4? What is the sum of 4 and 4? What's the total of 4 and 2? $4 + 2$</p> 
<p>Regrouping to make 10 by using ten frames and counters/cubes or using numicon:</p> <p>$6 + 5$</p> 	<p>Children to draw the ten frame and counters/cubes or numicon</p> 	<p>Children to develop an understanding of equality (equals sign) e.g</p> <p>$6 + \square = 11$ and</p> <p>$6 + 5 = 5 + \square$ $6 + 5 = \square + 4$</p>

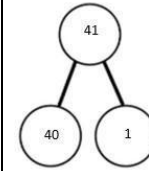
TO + O using base 10. Continue to develop understanding of partitioning and place value $41 + 8$



Children to represent the concrete using a particular symbol e.g. lines for tens and dot/crosses for ones.
lines for tens and dot/crosses for ones.



$41 + 8$



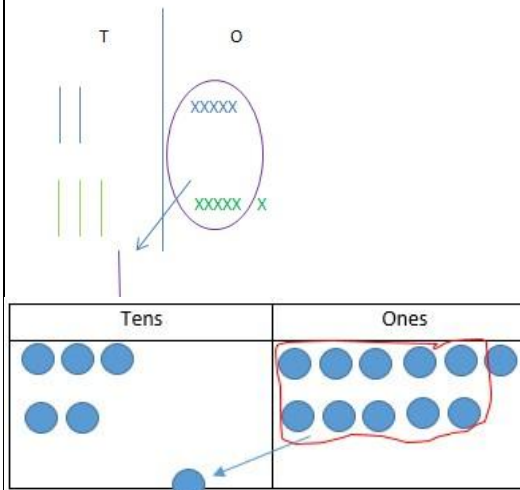
$1 + 8 = 9$
 $40 + 9 = 49$

	4	1
+		8
<hr/>		
	4	9

TO + TO/ HTO + HTO using base 10. Continue to develop understanding of partitioning and place value and use this to support addition. Begin with no exchanging. $36 + 25$

	Tens	Ones
+		
=		

This could be done one of two ways:



$36 + 25 =$

Looking for ways to make 10

$30 + 20 = 50$
 $5 + 5 = 10$
 $50 + 10 + 1 = 61$

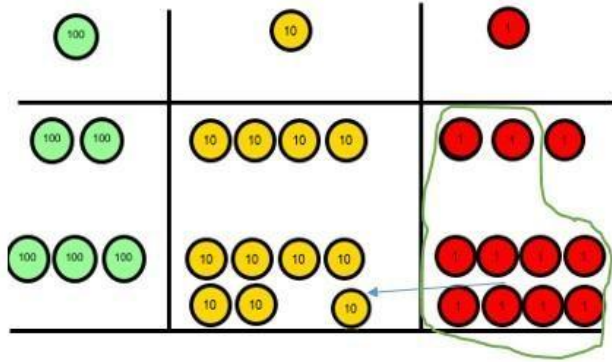
Formal method:

36
 $+25$

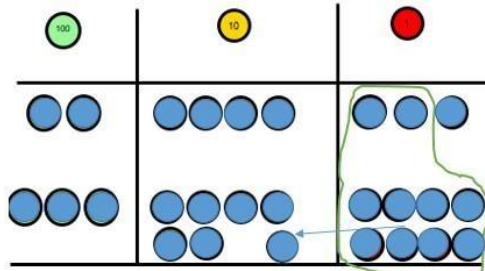
 61

 1

Use of place value counters to add HTO + TO, HTO + HTO and larger. Once the children have had practice with this, they should be able to apply it to larger numbers and the abstract

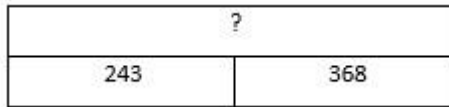


Children to represent the counters e.g. like the image below



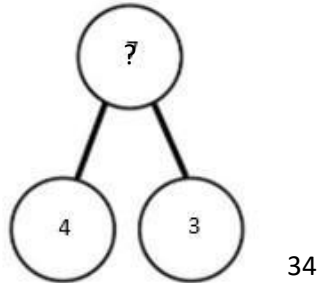
Draw a

bar model to represent what word problems are asking.



$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 11 \end{array}$$

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



21



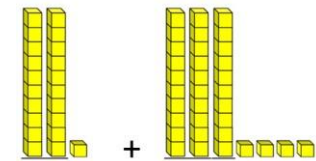
Sam saved £21 one week and £34 another. How much did he save in total?

21+34=55. Prove it! (reasoning but the children need to be fluent in representing this)

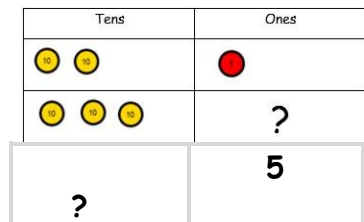
$$\begin{array}{r} 21 \\ +34 \\ \hline \end{array} \quad 21 + 34 =$$

$$\square = 21 + 34$$

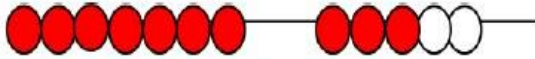
What's the sum of twenty-one and thirty four?



Always use missing digit problems too:



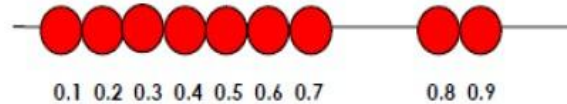
Use of bead strings to add decimals. Children should be confident in counting forwards and backwards in decimals – using bead strings to support.



Each bead represents 0.1, each different block of colour equal to 1.0

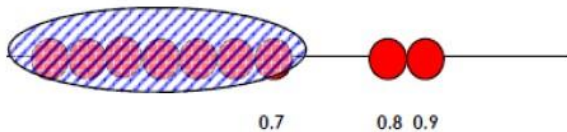
Counting both sets – starting at zero.

$$0.7 + 0.2 = 0.9$$



Starting from the first set total, count on to the end of the second set.

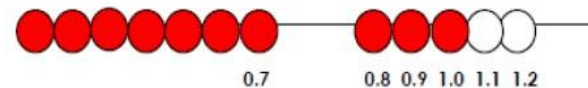
$$0.7 + 0.2 = 0.9$$



Bridging through 1.0

Encouraging connections with number bonds.

$$0.7 + 0.5 = 1.2$$



Base 10 can also be used to aid partitioning, if needed.

Children represent the counting beads using a number line.


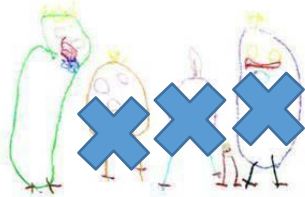
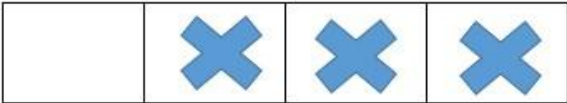
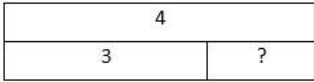
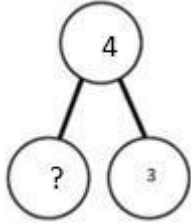
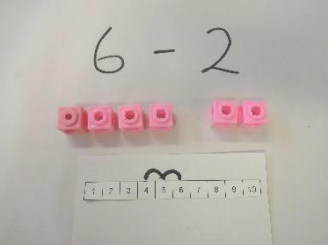
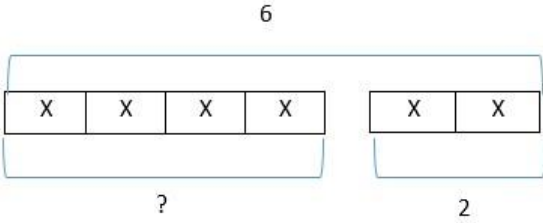
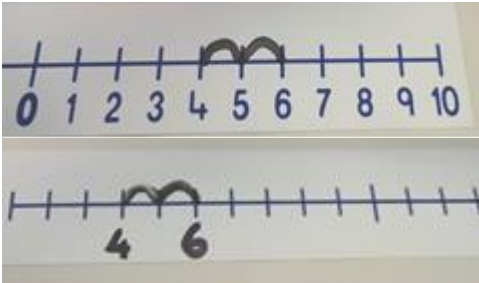
Adapt the abstract methods shown above for addition and use for decimals (Part, Part, Whole; Column method, equality etc)

Graduation of difficulty for addition:

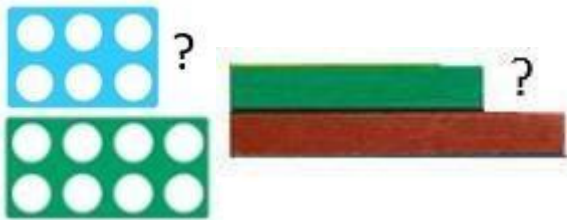
- No exchanging
- Extra digit in the answer (place value)
- Exchange ones for tens
- Exchange tens for hundreds
- Exchange ones for tens and tens for hundreds
- More than 2 numbers in the calculation
- Vary amount of digits in each number
- Decimals up to 2 dp
- Add 2 or more decimals with a range of dps

Subtraction-

Key language which should be used: take away, less than, the difference, subtract, minus, fewer, decrease, '7 take away 3, the difference is four'

Concrete	Pictorial	Abstract
<p>Physically taking away and removing objects from a whole (use various objects too) rather than crossing out- children will physically remove the objects</p> <p>$4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out.</p>  <p>Use of the bar model:</p> 	<p>$4 - 3 =$</p> <p><input type="text"/> = $4 - 3$</p>  
<p>Counting back (using number lines)</p> 	<p>Children to represent what they see pictorially e.g.</p> 	

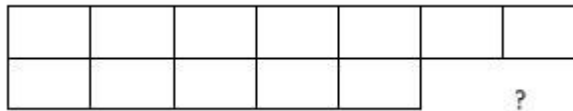
Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used)



Children to draw the cubes/other concrete objects which they have used

XXXXXXXXX
XXXXXX

Use of the bar model



Find the difference between 8 and 6.

$8 - 6$, the difference is?

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 $10000 - 9987$)

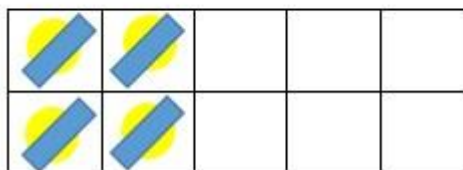
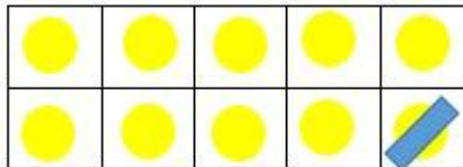
Making 10 (using numicon or ten frames) $14 - 5$



Children could also do this by subtracting a 5 from the 10.

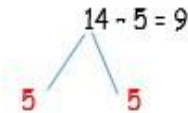


Children to present the ten frame/Numicon pictorially



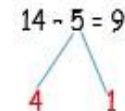
$14 - 5 = 9$ You also want children to see related facts e.g.

$15 - 9 = 5$



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

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



5 is made up of 4 & 1 so I can subtract 4 from the 14 to make 10, then 1 to get 9.

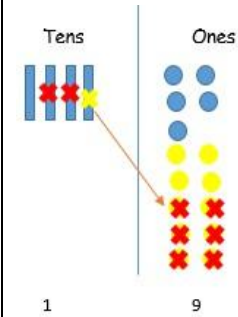
Column method (using base 10 with no regrouping and regrouping)

45-26



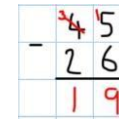
- 1) Start by partitioning 45
- 2) Exchange one ten for ten more ones
- 3) Subtract the ones, then the tens.

Represent the base 10 pictorially

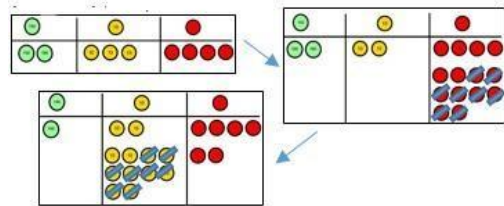


It's crucial that the children understand that when they have exchanged the 10 they still have

45 = 30 + 15



Column method (using place



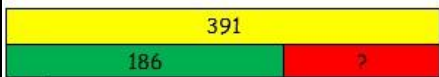
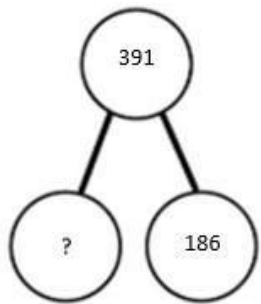
value counters) 234-88

Once the children have had practice with the concrete, they should be able to apply it to any subtraction.

Like the other pictorial representations, children to represent the counters.

$$\begin{array}{r} ^2 ^1 \\ 234 \\ - 88 \\ \hline 146 \end{array}$$

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



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

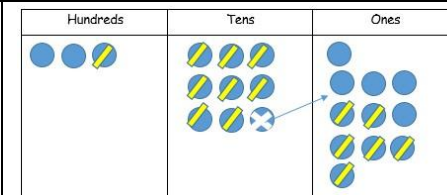
I had 391 metres to run. After 186 I stopped. How many metres do I have left to run?

391 - 186 =

= 391 - 186

$$\begin{array}{r} 391 \\ -186 \\ \hline \end{array}$$

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

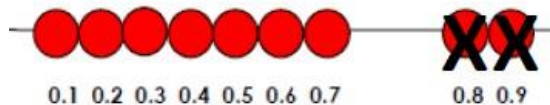


$$\begin{array}{r} 39\ \square \\ - \square\square\ 6 \\ \hline \square\ 0\ 5 \end{array}$$

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

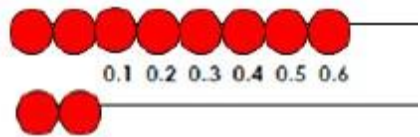
Use of bead strings to subtract decimals. Children should be confident in counting forwards and backwards in decimals – using bead strings to support.

Take away model:
 $0.9 - 0.2 = 0.7$



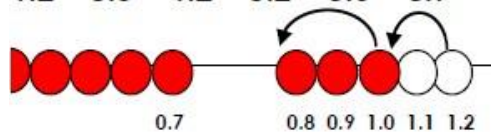
Finding the difference (comparison):

$$0.8 - 0.2 =$$



Bridging through 1.0:

$$1.2 - 0.5 = 1.2 - 0.2 - 0.3 = 0.7$$



Base 10 can also be used to aid partitioning, if needed.

Children represent the counting beads using a number line.

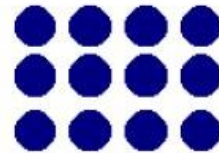
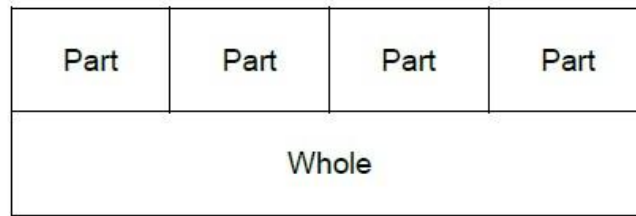
Adapt the subtraction abstract methods shown above for decimals.

Graduation of difficulty for subtraction:

- No exchanging
- Fewer digits in the answer
- Exchange tens for ones
- Exchange hundreds for tens
- Exchange ten for ones and hundreds for tens
- Vary the amount of digits
- Decimals up to 2dp
- Subtract 2 or more decimals with a range of dps

Multiplication and division are connected.



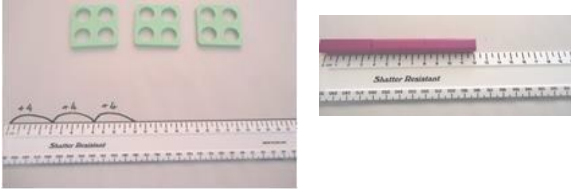
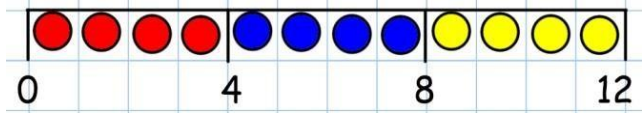
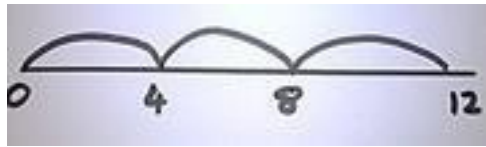

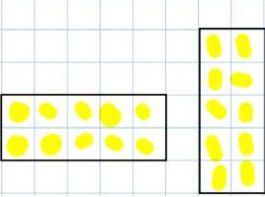
They both express the relationship between a number of equal parts and the whole



Multiplication is commutative, associative and distributive (see Appendix 3).

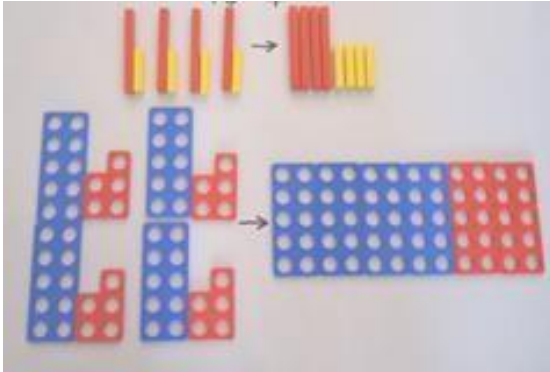
Multiplication-

Key language which should be used: double times, multiplied by, the product of, factors, multiplier, multiplicand, product, groups of, lots of, 'is equal to' 'is the same as'

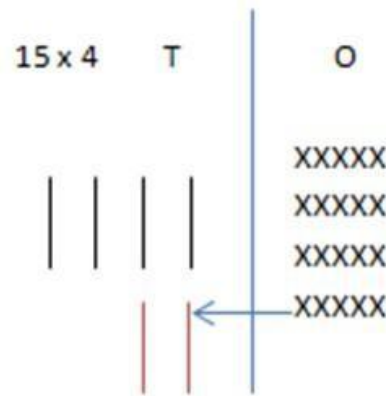
Concrete	Pictorial	Abstract
<p>Repeated grouping/repeated addition (does not have to be restricted to cubes) 3 x 4 or 3 lots of 4</p> 	<p>Children to represent the practical resources in a picture e.g.</p> <p>XX XX XX XX XX XX</p> <p>Use of a bar model for a more structured method</p> 	<p>3×4</p> <p>$4 + 4 + 4$</p>
<p>Use number lines to show repeated groups- 3 x 4</p> 	<p>Represent this pictorially alongside a number line e.g:</p> 	<p>Abstract number line</p> <p>$3 \times 4 = 12$</p> 
<p>Use arrays to illustrate commutativity (counters and other objects can also be used)</p> <p>$2 \times 5 = 5 \times 2$</p> 	<p>Children to draw the arrays</p> 	<p>Children to be able to use an array to write a range of calculations e.g.</p> <p>$2 \times 5 = 10$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $5 + 5 = 10$</p>

Partition to multiply (use numicon, base 10, Cuisenaire rods)

4×15



Children to represent the concrete manipulatives in a picture e.g. base 10 can be represented like:



Children to be encouraged to show the steps they have taken

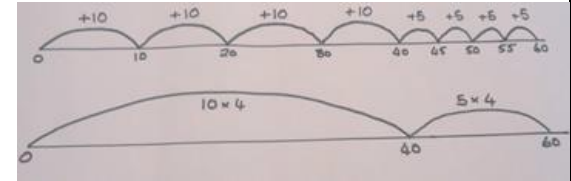
$$\begin{array}{r} 4 \times 15 \\ \swarrow \searrow \\ 10 \quad 5 \end{array}$$

$10 \times 4 = 40$

$5 \times 4 = 20$

$40 + 20 = 60$

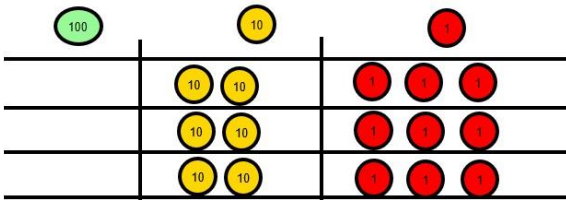
A number line can also be used



Formal column method with place value counters or base 10 (at the first stage- no exchanging) 3×23

3×23

Make 23, 3 times. See how many ones, then how many tens



Children to represent the counters in a pictorial way

Tens	Ones
6	9

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

$3 \times 23 = 69$

$$\begin{array}{r} 20 \quad 3 \\ \times 3 \\ \hline \end{array}$$

23

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

$3 \times 3 = 9$

$60 + 9 = 69$

Formal column method with place value counters (children need this stage, initially, to understand how the column method works)

Children to represent the counters/base 10, pictorially e.g. the image below.

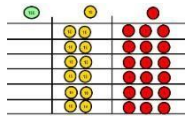
6×23

$6 \times 3 = 18$

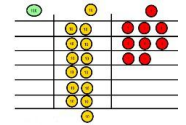
$6 \times 20 = 120$

$120 + 18 = 138$

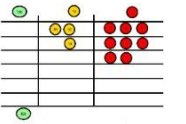
6×23



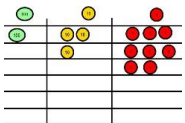
Step 1: get 6 lots of 23



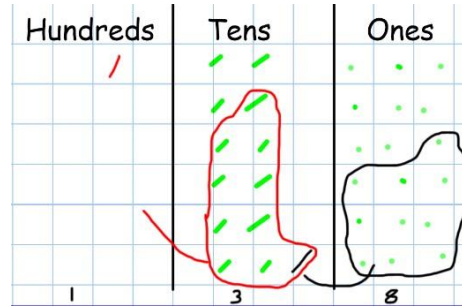
Step 2: 6×3 is 18.
Can I exchange? Yes!
Ten ones to one ten....



Step 3: 6×2 tens and my extra ten is 13 tens. Can I exchange? Yes! Ten tens to one hundred...



Step 4- what do I have in each column?



The aim is to get to the formal method but the children need to understand how it works.

$$\begin{array}{r}
 6 \times 23 = \\
 23 \\
 \times 6 \\
 \hline
 138 \\
 \hline
 11
 \end{array}$$

When children start to multiply 3 digit x 3 digit and 4 digit x 2 digit etc, they should be confident with the abstract:

To get 744 children have solved 6×124

To get 2480 they have solved 20×124

$$\begin{array}{r}
 124 \\
 \times 26 \\
 \hline
 744 \\
 2480 \\
 \hline
 3224 \\
 \hline
 11
 \end{array}$$

Answer: 3224

Fluency variation, different ways to ask children to solve 6×23 :

23	23	23	23	23	23
----	----	----	----	----	----

?

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

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

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?

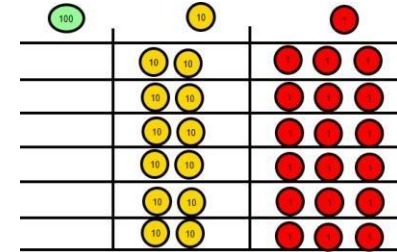
Find the product of 6 and 23

$$6 \times 23 =$$

$$= 6 \times 23$$

$$\begin{array}{r} 6 \\ \times 23 \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ \times 6 \\ \hline \end{array}$$

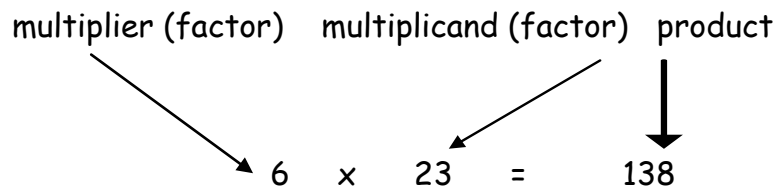
What's the calculation? What's the answer?



Sam had 6 giant marbles; he swapped each one for 23 of Max smaller marbles. How many marbles did Sam end up with?

Graduation of difficulty for multiplication:

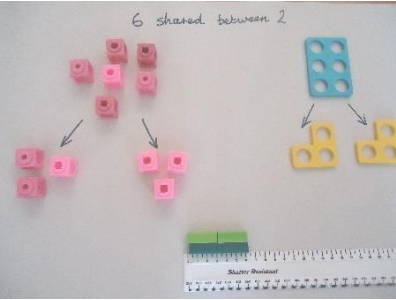
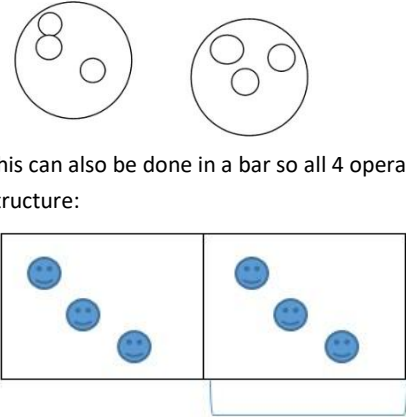
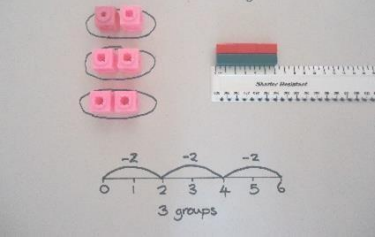
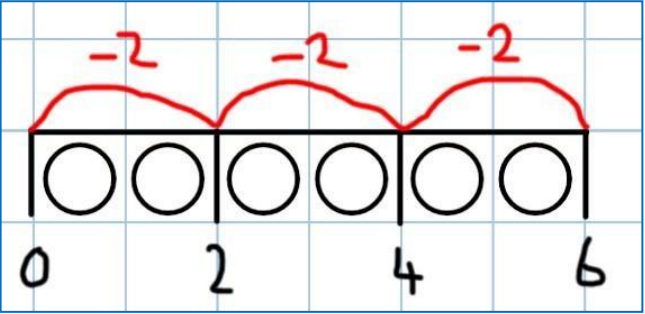
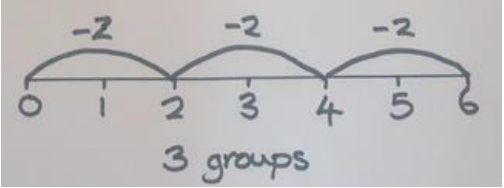
- No exchanging
- Extra digit in the answer
- Exchanging of ones for tens
- Increase number of digits
- Exchanging of tens for hundreds
- Exchanging of ones for tens and tens for hundreds
- Introduce a decimal to 2 dp
- Decimal with exchanging of tenths for ones to 2 dp
- Vary range of dps



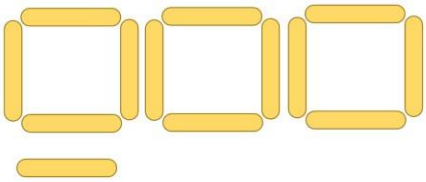
A concrete/pictorial representation of 6×23 would look different to one of 23×6 . 'x' means groups of or lots of, so 6 lots of 23, 23 groups of 6. Teaching children this should help with their accuracy.

Division-

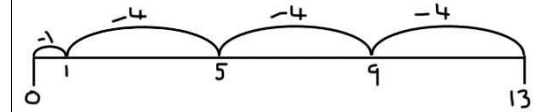
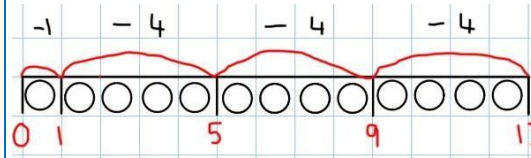
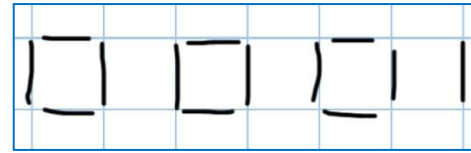
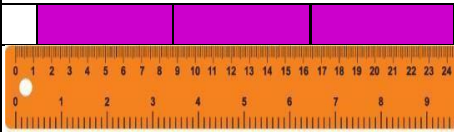
Key language which should be used: share, group, divide, divided by, half, 'is equal to' 'is the same as', dividend, divisor, quotient

Concrete	Pictorial	Abstract		
<p>6 shared between 2 (other concrete objects can also be used e.g. children and hoops, teddy bears, cakes and plates)</p>  <p>A photograph showing six pink blocks being divided into two groups of three. A blue tray with six holes is also shown, with arrows pointing to two yellow trays, each containing three holes.</p>	<p>Pictorial</p>  <p>Two circles, each containing three small white circles. Below them is a bar model divided into two equal halves, each containing three blue smiley faces.</p> <p>This can also be done in a bar so all 4 operations have a similar structure:</p>	<p>Abstract</p> <p>$6 \div 2 = 3$</p> <p>What's the calculation?</p> <table border="1" data-bbox="1402 435 1850 505"> <tr> <td style="text-align: center; width: 50px;">3</td> <td style="text-align: center; width: 50px;">3</td> </tr> </table>	3	3
3	3			
<p>Understand division as repeated grouping and subtracting</p> <p>$6 \div 2$</p>  <p>A photograph showing six pink blocks grouped into three pairs of two. Below it is a number line from 0 to 6 with three arcs labeled '-2' and the text '3 groups'.</p>	 <p>A number line from 0 to 6 with circles at each integer. Three red arcs are drawn above the line, each labeled '-2', starting at 0, 2, and 4, and ending at 2, 4, and 6 respectively.</p>	<p>Abstract number line</p>  <p>A number line from 0 to 6 with circles at each integer. Three grey arcs are drawn above the line, each labeled '-2', starting at 0, 2, and 4, and ending at 2, 4, and 6 respectively. The text '3 groups' is written below the line.</p>		
<p>$2d \div 1d$ with remainders</p> <p>$13 \div 4 = 3$ remainder 1</p>	<p>Children to have chance to represent the resources they use in a pictorial way e.g. see below:</p>	<p>$13 \div 4 = 3$ remainder 1</p> <p>Children to count their times tables facts in their heads</p>		

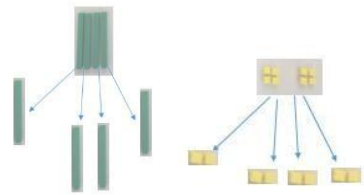
Use of lollipop sticks to form wholes



Use of
Cuisenaire rods and rulers (using repeated subtraction)



2d divided by 1d using base 10 (no remainders) SHARING
 $48 \div 4 = 12$



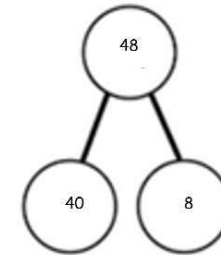
Start with the tens.

Children to represent the base 10 and sharing pictorially.

$$48 \div 4$$

$$4 \text{ tens} \div 4 = 1 \text{ ten}$$

$$8 \text{ ones} \div 4 = 2 \text{ ones}$$

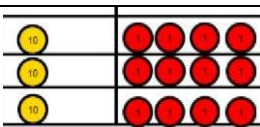
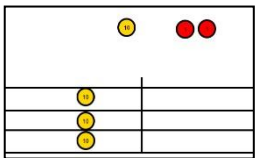


$$10 + 2 = 12$$

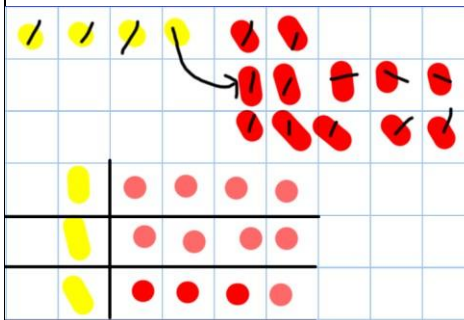
Sharing using place value counters.

$$42 \div 3 = 14$$

1. Make 42. **Share** the 4 tens between 3. Can we regroup the extra 10?



Regroup the ten for 10 ones and share out 12 ones



$$42 \div 3$$

$$42 = 30 + 12$$

$$30 \div 3 = 10$$

$$12 \div 3 = 4$$

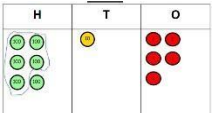
$$10 + 4 = 14$$

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**

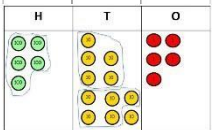
be done using sharing!



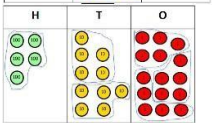
Step 1: make 615



Step 2: Circle your groups of 5



Step 3: Regroup 1H into 10T and circle groups of 5



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

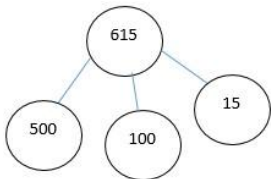
This can easily be represented pictorially, until the children no longer need to do it.

It can also be done to decimal places if you have a remainder!

$$5 \overline{) 615} \begin{matrix} 123 \\ \\ \end{matrix}$$

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?

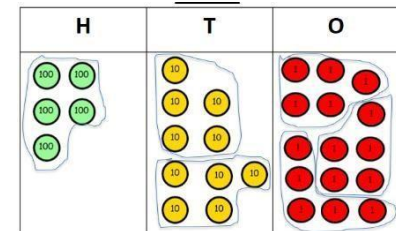
$$5 \overline{) 615}$$

$$615 \div 5 =$$

$$\square = 615 \div 5$$

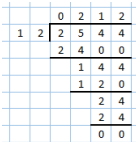
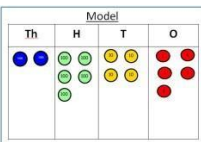
How many 5's go into 615?

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

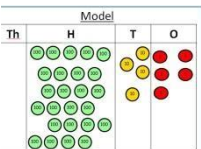


Long division

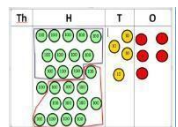
Concrete	Pictorial	Abstract
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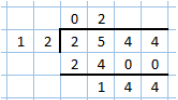
$2544 \div 12$
How many groups of 12 thousands do we have? None



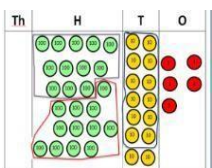
2 thousands can be exchanged for 20 hundreds so we now have 25 hundreds.



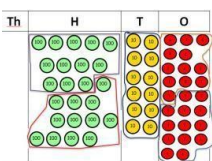
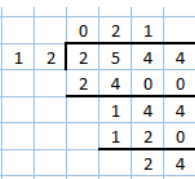
How many groups of 12 hundreds are in 25 hundreds? 2 groups. Circle them. We have grouped 24 hundreds (2400) so can subtract this and we are



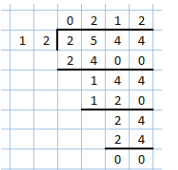
left with 144.



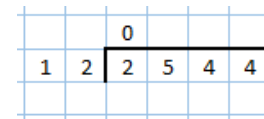
How many groups of 12 hundred are in 1 hundred. None. Exchange the 1 hundred for 10 tens so we now have 14 tens. How many groups of 12 tens can we make from 14 tens. 1 group. Circle it. We have grouped 12 tens (120) so we can subtract this and we are left with 24.



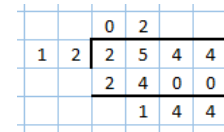
How many groups of 12 tens can we make from 2 tens? None. Exchange 2 tens for 20 ones. We now have 24 ones. How many groups of 12 ones can we make from 24 ones. 2 groups. Circle them. We have grouped 24 ones so we can subtract this and we are left with zero.



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

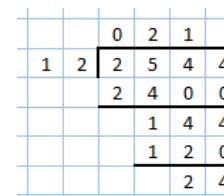


We can't make any groups of 12 thousands from 2,000



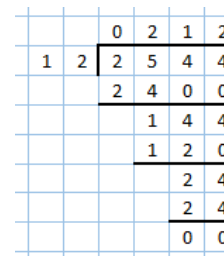
I can make 2 groups of 12 hundreds from 25 hundreds. 2 groups of 12 hundreds is 24

hundreds (2400). I subtract the 2400 that has been divided leaving 144 remaining.



We can't make any groups of 12 hundred from 100. I can make 1 group of 12 tens from 14

tens is 120. I subtract the 120 that has been divided leaving 24.

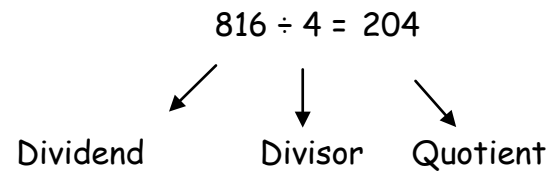


We can't make any groups of 12 tens from 2 tens. I can make 2 groups of 12 ones from 24 ones. 2 groups of 12 ones is 24. I subtract the 24

that has been divided leaving zero.

Graduation of difficulty for division:

- No exchanging and no remainder
- No exchanging with a remainder
- Exchanging no remainder
- Exchanging and remainder
- Zero in the quotient ($816 \div 4 = 204$)
- Introduce a decimal dividend ($7.5 \div 5$ or $0.12 \div 3$)
- Make the divisor a 2 digit number
- Express remainder as a fraction of the divisor ($21 \div 4 = 5\frac{1}{4}$)
- Express the remainder as a simplified fraction
- Express the remainder as a decimal



Dividend is the number being divided.

Divisor is the number 'doing' the dividing.

Quotient is the answer.

Sharing: looking at problems that involve sharing a number of items between a number of different people (doesn't always have to be people).

Example: I have 12 sweets and share them with 2 of my friends, how many sweets would we have each? $12 \text{ sweets} \div 3 \text{ people} = ? \text{ sweets each}$

Grouping: how many groups of a given number you can make out of a pile of items.

Example: I have 12 sweets, I keep 4 for myself and give each of my friends 4 sweets. How many friends do I have?

$12 \text{ sweets} \div ? \text{ people} = 4 \text{ sweets each}$

Appendix 1: Resources

Resources are kept both centrally (in the resources cupboard) and in classes.

Resources in the resources cupboard are for specific topics, for example 3D shapes, polyhedron, clocks, scales etc. After these resources have been used, they should be returned to Sam Klausner.

Resources in classes should be out during every maths lesson, with one box per table. Resource boxes consist of:

- bead strings
- Base 10
- Multilink cubes
- Place value counters

The items in the box are designed to assist children with their number sense and children should be encouraged to use them.

Resources will be audited and reviewed on a yearly basis.

Appendix 2: Representations

Below are a variety of representations of the same number. Children should be familiar with all of these and be able to talk about them and use them confidently.

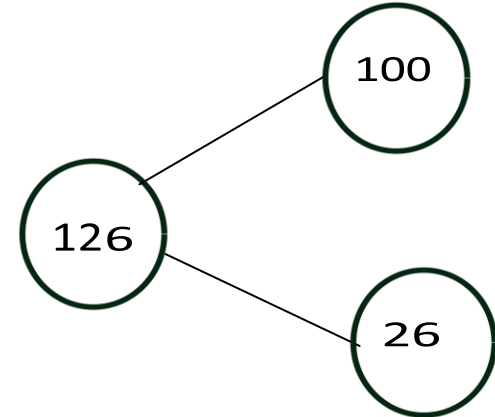
Words:

One hundred and twenty-six

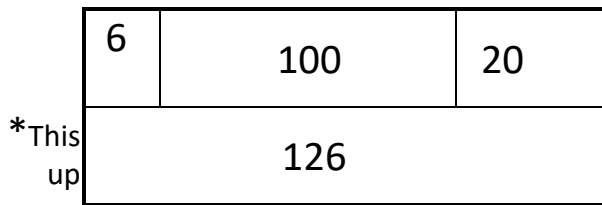
Expanded Form:

$$100 + 20 + 6$$

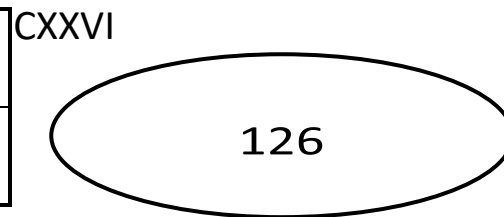
*Part Whole:



Bar model:



Roman numerals:

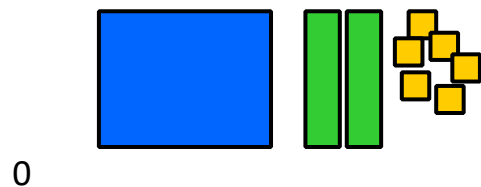


model can be made of more than 2 parts.

Pictorial representation of Number

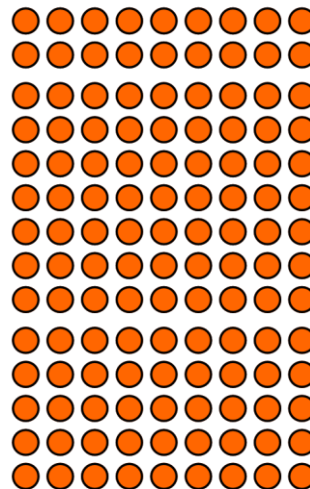
140 - 14 = 126 equipment:

Base 10 126 > 100



Number line:

Array:



sentence:



Number story/word problem

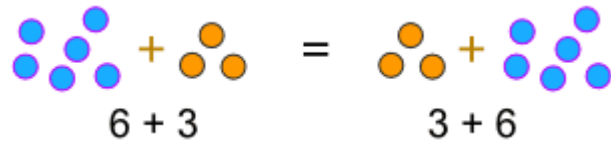
Appendix 3: Commutative, Associative and Distributive Laws

The "Commutative Laws" say we can swap numbers over and still get the same answer...

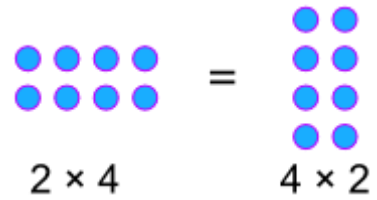
... when we add:

...when we multiply:

$$a + b = b + a$$



$$a \times b = b \times a$$



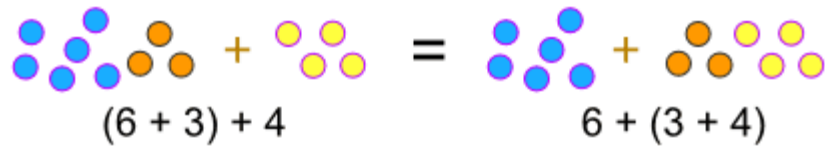
The numbers can travel back and forth like a commuter!

The "Associative Laws" say that it doesn't matter how we group the numbers (i.e. which we calculate first)...

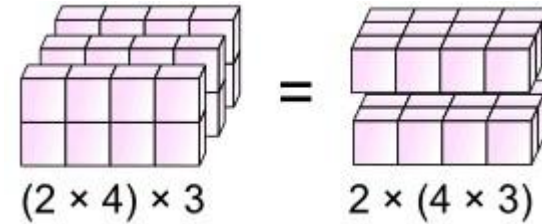
... when we add:

...when we multiply:

$$(a + b) + c = a + (b + c)$$



$$(a \times b) \times c = a \times (b \times c)$$



Examples:

Sometimes it is easier to add or multiply in a different order:

What is $19 + 36 + 4$?

$$19 + 36 + 4 = 19 + (36 + 4) = 19 + 40 = 59$$

Or to rearrange a little:

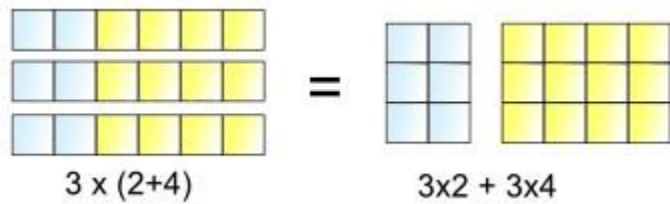
What is $2 \times 16 \times 5$?

$$2 \times 16 \times 5 = (2 \times 5) \times 16 = 10 \times 16 = 160$$

The "Distributive Law" needs careful attention.

This is what it lets us do:

$$a \times (b + c) = a \times b + a \times c$$



3 lots of (2+4) is the same as 3 lots of 2 plus 3 lots of 4 so, the 3x can be "distributed" across the 2+4, into 3x2 and 3x4

Uses:

Sometimes it is easier to break up a difficult multiplication:

Example: What is 6×204 ? $6 \times 204 = 6 \times 200 + 6 \times 4 = 1,200 + 24 = 1,224$

Or to combine:

Example: What is $16 \times 6 + 16 \times 4$? $16 \times 6 + 16 \times 4 = 16 \times (6+4) = 16 \times 10 = 160$

We can use it in subtraction too:

Example: $26 \times 3 - 24 \times 3$? $26 \times 3 - 24 \times 3 = (26 - 24) \times 3 = 2 \times 3 = 6$

We could use it for a long list of additions too:

Example: $6 \times 7 + 2 \times 7 + 3 \times 7 + 5 \times 7 + 4 \times 7$? $6 \times 7 + 2 \times 7 + 3 \times 7 + 5 \times 7 + 4 \times 7 = (6+2+3+5+4) \times 7 = 20 \times 7 = 140$