



John Wycliffe Primary School Calculation Policy



This policy has been adapted from the White Rose Maths Hub Calculation Policy. It is a working document and will be revised and amended, as necessary.



Contents

Addition: KS1 pg 4 KS2 pg 9

Subtraction: KS1 pg 15 KS2 pg 20

Multiplication: KS1 pg 25 KS2 pg 28

Division: KS1 pg 33 KS2 pg 35

More Stem sentences pg 41

Addition

Key Language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

GUIDANCE / MODELS AND IMAGES

If available, Numicon shapes are introduced straight away and can be used to:

- identify 1 more/less
- combine pieces to add.
- find number bonds.
- add without counting.



Children can record this by printing or drawing around Numicon pieces.

Children begin to combine groups of objects using concrete apparatus



Construct number sentences verbally or using cards to go with practical activities.

Children are encouraged to read number sentences aloud in different ways

“Three add two equals 5” “5 is equal to three and two”

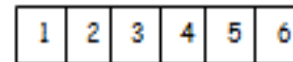
Children make a record in pictures, words or symbols of addition activities already carried out.

Solve simple problems using fingers



$$5 + 1 = 6$$

Number tracks can be introduced to count up on and to find one more:



What is 1 more than 4? 1 more than 13?

Number lines can then be used alongside number tracks and practical apparatus to solve addition calculations and word problems.



Children will need opportunities to look at and talk about different models and images as they move between representations.

Vocabulary: **New vocabulary for this year group is in red.**

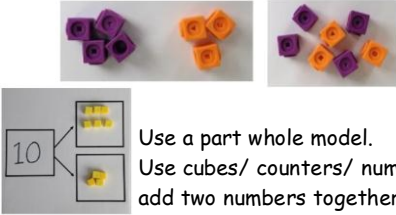
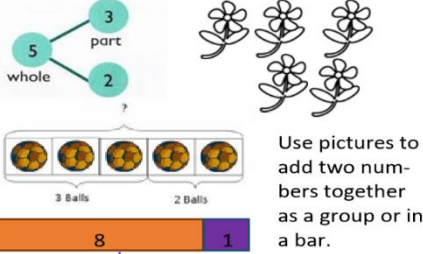

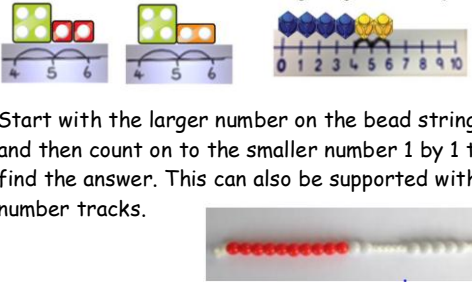
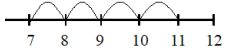
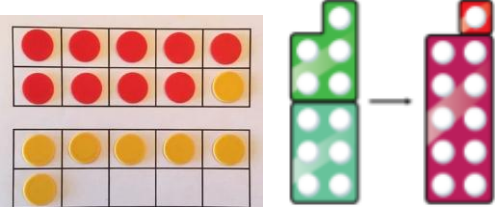
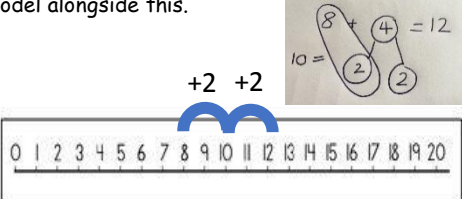
add, more, and
make, sum, total
altogether

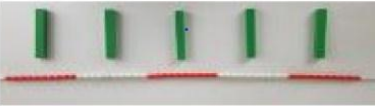

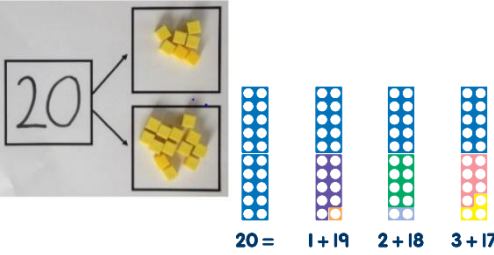
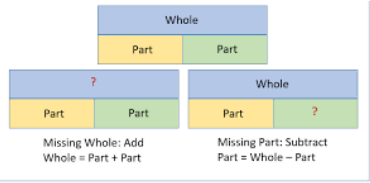
score

double

one more, two more, ten
more...

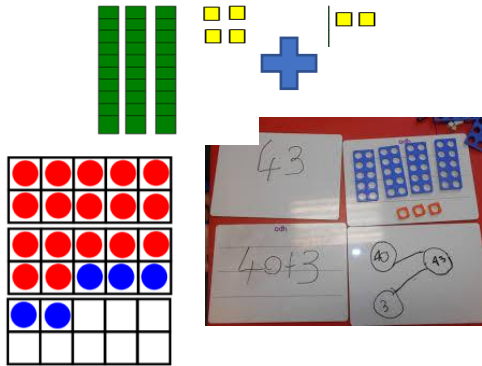
how many more to make... ?

Y1 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences				
<p>To combine two parts to make a whole.</p>	 <p>Use a part whole model. Use cubes/ counters/ numicon to add two numbers together as a group.</p>	 <p>Use pictures to add two numbers together as a group or in a bar.</p>	<p>$4 + 3 = 7$</p>  <p>$10 = 6 + 4$</p> <p>Adding two numbers together as a group or in a bar model alongside pictures.</p>	<p>___ is a whole. ___ is a part. ___ represents ___ whole/part.</p> <p>___ red counters add/plus ___ yellow counters equals ___ counters. The counters/ cubes represent ___.</p>				
<p>Starting at the bigger number and counting on.</p>	 <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. This can also be supported with number tracks.</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>$7 + 4 =$</p>  <p>Use of a bar model will encourage the children to count on, rather than count all the numbers.</p> <table border="1" data-bbox="1077 759 1312 831"> <tr><td colspan="2">?</td></tr> <tr><td>7</td><td>4</td></tr> </table>	?		7	4	<p>Place the larger number in your head and count on the smaller number to find your answer. Encourage child to use a whole part draw their own diagram.</p>	<p>___ is the odd one out because ___.</p> <p>___ is a part. ___ is a part. The whole is ___.</p> <p>There are ___ spiders/ aeroplanes/ counters altogether.</p> <p>___ add/ plus ___ is ___</p>
?								
7	4							
<p>Regrouping to make 10. This is an essential skill for column addition later. <i>This is an essential skill for using the column method.</i></p>	<p>Using tens frames or numicon to support with regrouping.</p> 	<p>Use pictures/ number line or draw the tens frames with counters. Use the whole part model alongside this.</p> 	<p>Children to develop an understanding of equality e.g.</p> <p>$6 + \square = 11$</p> <p>$6 + 5 = 5 + \square$</p> <p>$6 + 5 = \square + 4$</p>	<p>First there were ___ cars in the car park. Then ___ more cars parked in the car park. Now there are ___ cars in the car park.</p> <p>I partitioned the <u>7</u> into <u>4</u> and <u>3</u> so that I could make a full <u>10</u></p>				
<p>Represent & use number bonds and related subtraction facts within 20 - Use the above examples to support this. When using these methods, you should always be using a hundred square/ number line alongside the models.</p>								
<p>Vocabulary: <i>New vocabulary for this year group is in red.</i> add, more, plus make, sum, total altogether score double, near double one more, two more... ten more how many more to make...? how many more is... than...? how much more is...? -, subtract, take (away), minus leave how many are left/left over? how many have gone? one less, two less, ten less... how many fewer is... than...? how much less is...? difference between half, halve =, equals, sign, is the same as</p>								

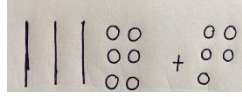
Y2 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences
<p>Adding multiples of ten</p>	<p>Use base ten, bead strings and numicon. Show this alongside a numberline/ hundred square.</p> 	<p>Use representations for base ten - line - chips Images of bundles/ bags that represent 10.</p> 	$20 + 30 = 50$ $70 = 50 + 20$ $40 + \square = 60$	<p>Use Year 1 stem sentences.</p> <p>Ron/ Fred/ Lucy is correct/incorrect because....</p> <p>It should have been....</p> <p>The digits/ calculations are the same but...</p> <p>If I know $9 + 1 = 10$, I can work out $90 + \underline{\quad} = 100$</p> <p>True/ False because....</p>
<p>Using known number facts</p>	<p>Children explore different ways of making 20 and numbers up to 20 - exploring both subtraction and addition facts.</p> 	<p>Children to draw representations such as bar models and whole part models to support them.</p> 	<p>I know that.....</p> $16 + 4 = 20$ <p>Because I know that..</p> $6 + 4 = 10$ <hr/> <p>I know that</p> $20 + 70 = 90$ <p>Because I know that</p> $2 + 7 = 9$ <p>So I also know..</p> $200 + 700 = 900$	<p>I started at ____ and counted on ____.</p> <p>I have to exchange ____ which will change the tens digit to ____.</p> <p>____ is the smallest/ largest total.</p> <p>The most efficient method</p>

Adding ones to a 2 digit number

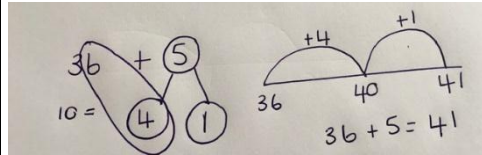
Use base ten, tens frames or numicon. This will help children to continue to develop their understanding of partitioning and place value. Encourage children to explore patterns.



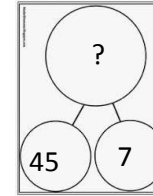
Children to draw lines and dots to represent base ten - we call this chips and peas. Chips representing 10 and peas representing 1s.



Use a part whole model and a numberline. Children will need to use their number facts for this.



Show the related facts for $45 + 7 =$



?	
45	7

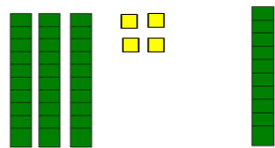
$\underline{\quad} + \underline{\quad} = \underline{\quad}$
 $\underline{\quad} - \underline{\quad} = \underline{\quad}$
 $\underline{\quad} = \underline{\quad} + \underline{\quad}$ etc.

is ____
 Altogether they have
 The correct answer is ____
 this could have been shown
 by ____

Adding a ten

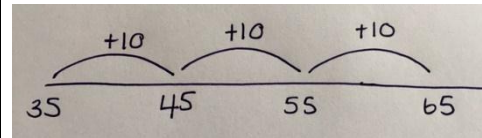
Use base ten/ numicon/ (Place Value counters can be used once children have a secure understanding of the value of digits). Let children explore that the ones digit does not change.

$34 + 10 = 44$

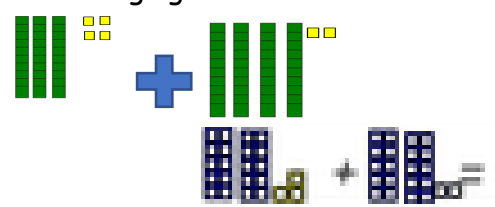
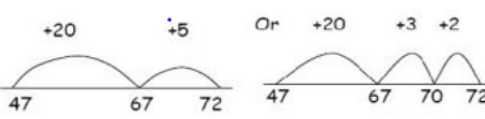
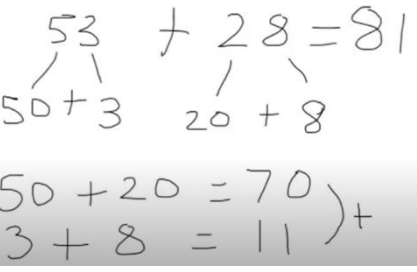
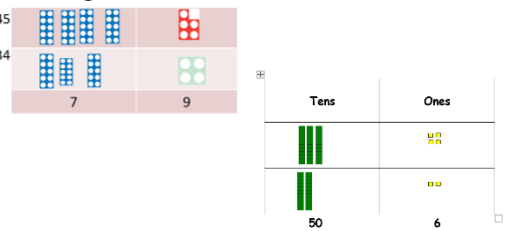
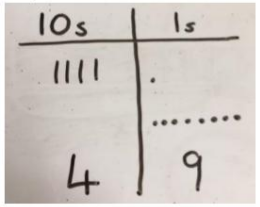
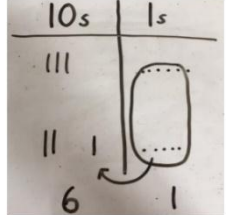
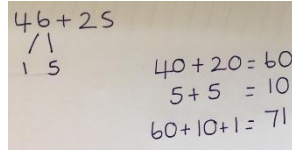
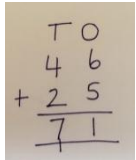


Drawing base ten (chips and peas). Use a numberline/ hundred square to support the jumping in 10s.

$35 + 30 = 65$



- $34 + 10 = 44$
- $34 + 20 = 54$
- $34 + 30 = 64$
- $34 + \underline{\quad} = 74$

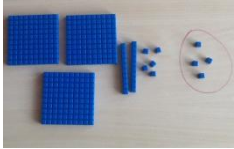
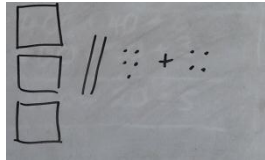
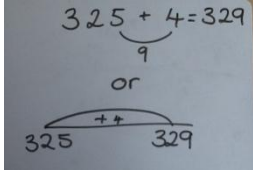
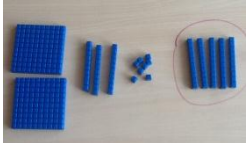
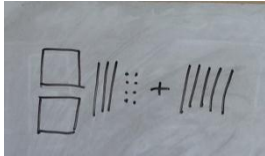
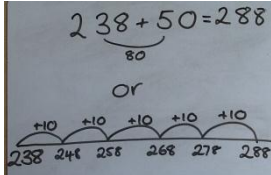
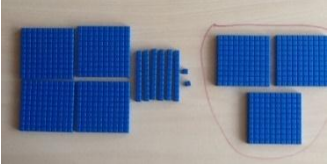
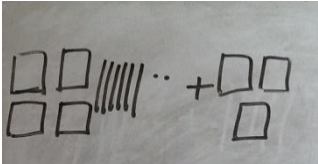
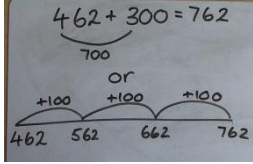
<p>Add two 2-digit numbers</p>	<p>Use base ten/ numicon. This will develop partitioning and place value and support children's understanding of exchanging.</p> 	<p>Represent their own drawings of base ten. Use number line to bridge ten. Use this alongside a part whole model to support.</p> 		
<p>Column Addition Only to be started when children understand and are confident with the above method.</p>	<p>Use either base ten or numicon (place value counters will be used from Year 3 where there is a stronger understanding of number). Add the ones first then the tens. If required, exchange the tens.</p> 	<p>Represent base ten for calculations using a place value frame. If crossing the tens, show your exchanging.</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="828 662 1086 933"> <p>41 + 8</p>  </div> <div data-bbox="1086 662 1310 941"> <p>36 + 25</p>  </div> </div>	<p>Looking for ways to make 10.</p>  <p>Formal method:</p> 	

Vocabulary: *New vocabulary for this year group is in red.*

+ , add, **addition**, more, plus make, sum, total altogether score double, near double one more, two more... ten more... **one hundred more** how many more to make...? how many more is... than...? how much more is...? - , subtract, **subtraction**, take (away), minus leave, how many are left/left over? one less, two less... ten less... **one hundred less** how many fewer is... than...? how much less is...? difference between half, halve =, equals, sign, is the same as **tens boundary**

Yr 3 Concrete	Pictorial	Abstract	Examples of Stem Sentences
---------------	-----------	----------	----------------------------

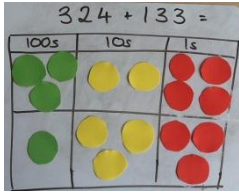
Add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens, a three-digit number and hundreds.

			<p>5 ones and 4 ones equals 9 ones</p>
			<p>3 tens and 5 tens equals 8 tens</p>
			<p>4 hundreds and 3 hundreds equals 7 hundreds</p>

Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.

No exchange

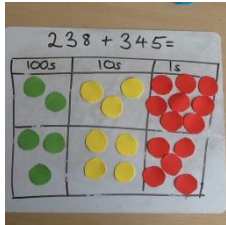
Use Place value counters to represent the Hs, Ts and units then combine them.



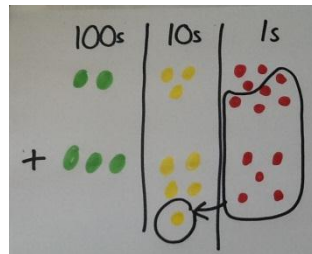
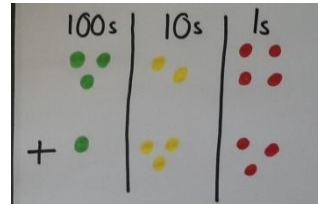
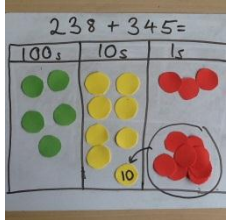
With exchange

Where the column total reaches ten or more, exchange into the next column.

1)



2)



$$\begin{array}{r} 300 + 20 + 4 \\ + 100 + 30 + 3 \\ \hline 400 + 50 + 7 \end{array}$$

Partition the digits into the numbers they represent to give a clear idea of what is happening to the numbers.

$$\begin{array}{r} 200 + 30 + 8 \\ + 300 + 40 + 5 \\ \hline 500 + 70 + 13 \\ \text{or} \\ 500 + 80 + 3 \end{array}$$

Three hundred and twenty four add one hundred, three tens and three ones.

Exchange 10 ones for 1 ten.

Vocabulary: *New vocabulary for this year group is in red.*

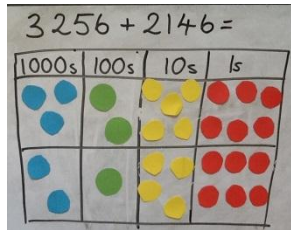
+ , add, addition, more, plus, make, sum, total, altogether, score, double, near double, one more, two more... ten more... one hundred more how many more to make...? how many more is... than...? how much more is...?

Y4 Concrete	Pictorial	Abstract	Examples of Stem Sentences
-------------	-----------	----------	----------------------------

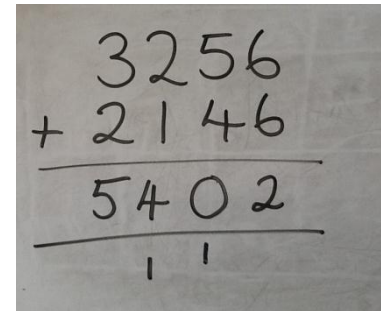
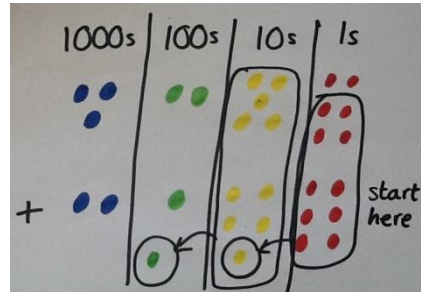
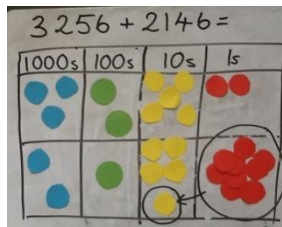
Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition where appropriate.

As Year 3 and:

1)



2)



Combine the digits to form the complete number.
Children should now have a very clear understanding of what each digit represents.

Three thousand, two hundred and fifty six add two thousands, one hundred, four tens and six ones.

Exchange 10 ones for 1 ten.

Exchange 10 tens for 1 hundred.

Exchange 10 hundreds for 1 thousand.

Vocabulary: New vocabulary for this year group is in red.

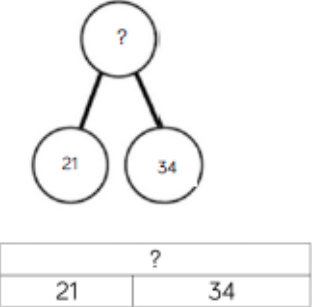

add, addition, more, plus, increase, sum, total, altogether, score, double, near double, how many more to make...? equals, sign, is the same as, tens boundary, hundreds boundary, inverse

Vocabulary: New vocabulary for this year group is in red.

add, addition, more, plus, increase, sum, total, altogether, score, double, near double, how many more to make...?, equals, sign, is the same as, tens boundary, hundreds boundary, units boundary, tenths boundary, hundredths boundary, inverse

Y6 Concrete	Pictorial	Abstract	Examples of Stem Sentences
As Years 3, 4 and 5.			

Conceptual Variation for Addition (different ways to ask children to solve the same calculation)

	<p>Word problems: In year 3, there are 21 children and in year 4, there are 34 children. How many children in total?</p> <p>$21 + 34 = 55$. Prove it</p>	$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$ <p>$21 + 34 =$</p> <p><input type="text"/> = $21 + 34$</p> <p>Calculate the sum of twenty-one and thirty-four.</p>	 <p>Missing digit problems:</p> <table border="1" data-bbox="1783 919 2002 1082"> <thead> <tr> <th>10s</th> <th>1s</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td>?</td> </tr> <tr> <td>?</td> <td>5</td> </tr> </tbody> </table>	10s	1s				?	?	5
10s	1s										
	?										
?	5										

Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease

GUIDANCE / MODELS AND IMAGES

Children begin with mostly pictorial representations

X X X



Concrete apparatus is used to relate subtraction to taking away and counting how many objects are left.

Concrete apparatus models the subtraction of 2 objects from a set of 5.

Construct number sentences verbally or using cards to go with practical activities.

Children are encouraged to read number sentences aloud in different ways "five subtract one leaves four" "four is equal to five subtract one"

Children make a record in pictures, words or symbols of subtraction activities already carried out.

Solve simple problems using fingers

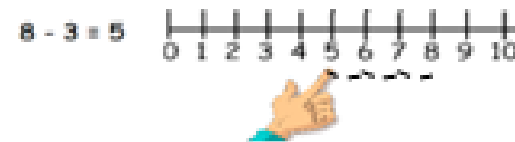


Number tracks can be introduced to count back and to find one less:



What is 1 less than 9? 1 less than 20?

Number lines can then be used alongside number tracks and practical apparatus to solve subtraction calculations and word problems. Children count back under the number line.



Children will need opportunities to look at and talk about different models and images as they move between representations.

Vocabulary: New vocabulary for this year group is in red.

take (away),

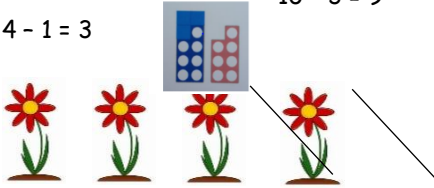
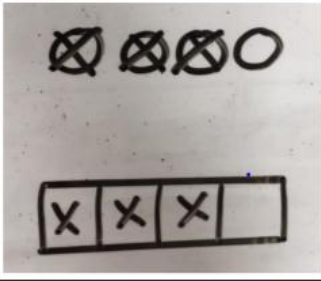
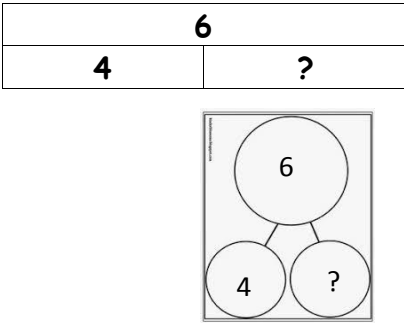
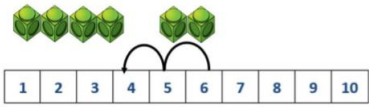
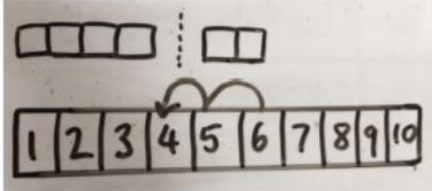
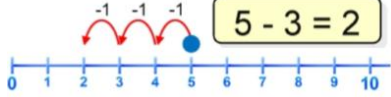
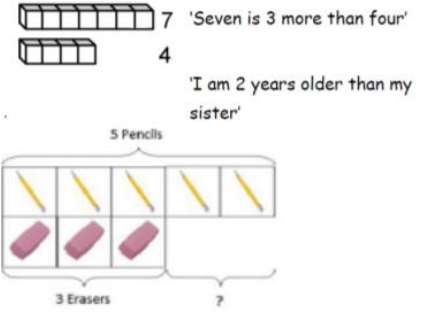
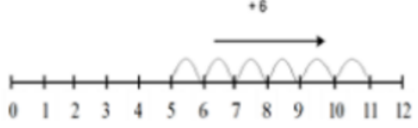
leave how many are left/left over?

how many have gone?

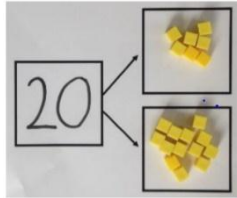
one less, two less... ten less...

how many fewer is... than...?

difference between is the same as

Y1 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences
<p>Physically taking away and removing objects from a whole</p>	<p>Use physical objects, counters, cubes etc to show how objects can be taken away. You can use numicon by placing pieces on top of each other and counting what is left.</p> <p>$4 - 1 = 3$</p> <p>$10 - 3 = 9$</p> 	<p>Draw counters, cubes etc and cross out the amount they should be taking away.</p> 	<p>$6 - 4 = ?$ $? = 6 - 4$</p> 	<p>_____ is a whole. _____ is a part. _____ represents _____ whole/part.</p> <p>_____ red counters add/plus _____ yellow counters equals _____ counters. The counters/ cubes represent _____.</p> <p>_____ is the odd one out because _____.</p> <p>_____ is a part. _____ is a part.</p> <p>The whole is _____.</p> <p>The difference between..... is _____</p> <p>_____ Subtract _____ is _____</p> <p>To find the unknown part, I need to _____</p> <p>_____ and _____ have the difference of _____.</p>
<p>Counting back</p>	<p>Use cubes/ numicon alongside number lines of number tracks. Start at the 6 and count back 2.</p> <p>$6 - 2 = 4$</p> 	<p>Children to draw what they see pictorially.</p> 	<p>Represent the calculation on a number line or number track with umps. Encourage children to use an empty number line</p> 	<p>_____ and _____ have the difference of _____.</p>
<p>Finding the difference</p>	<p>Compare objects and amounts.</p> <p>7 'Seven is 3 more than four'</p> <p>4 'I am 2 years older than my sister'</p> <p>5 Pencils</p> <p>3 Erasers</p> <p>?</p> <p>Lay objects out to represent the bar model.</p> 	<p>Counting on a number line to find out the difference.</p> 	<p>Finding the difference between 9 and 6. $9 - 6$, the difference is _____</p> <p>Children to explore numbers that have the same differences.</p> <p>Hannah has 12 sweets and her sister has 5. How many more does Hannah have than her sister?</p>	<p>_____ and _____ have the difference of _____.</p>

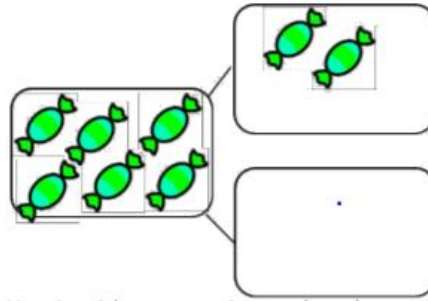
Represent and use number bonds and related subtraction facts within 20



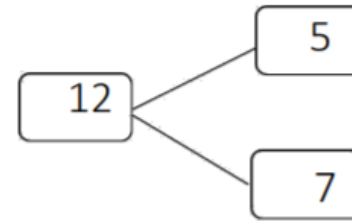
Link to addition through using a part whole model.

If 20 is the whole and 7 is a part.
What is the other part?
 $20 - 7 = \underline{\quad}$

Use pictorial representations to show the part and whole.



Then use numbers within the part whole model.



Making 10

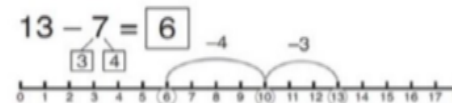
$14 - 5 =$



14 -4 -1

Use a number line and a part whole model.
Jump back 3 first, then another 4. Use ten as the stopping point.

$13 - 7 =$



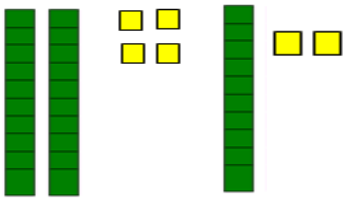

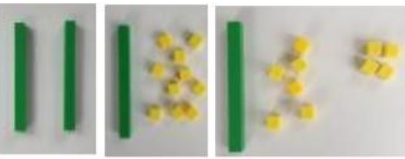

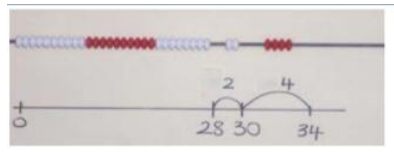
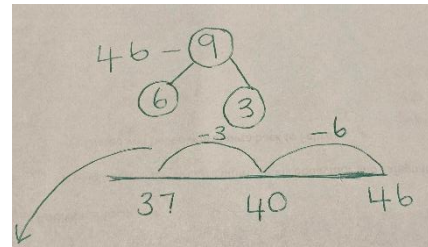
Children to use blank number lines to support them to answer questions.

$16 - 8 =$

How many do we take off first to get to 10? How many left to take off?

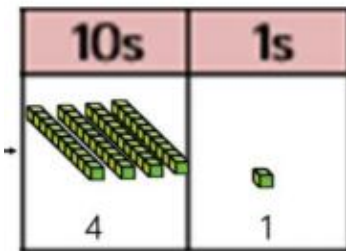
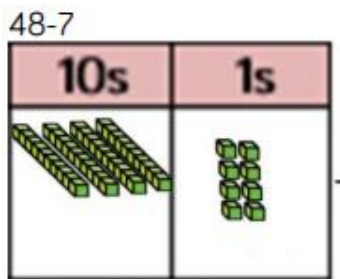
Vocabulary: New vocabulary for this year group is in red.

add, more, plus make, sum, total altogether score double, near double one more, two more... ten more how many more to make...? how many more is... than...? how much more is...? -, subtract, take (away), minus leave how many are left/left over? how many have gone? one less, two less, ten less... how many fewer is... than...? how much less is...? difference between half, halve =, equals, sign, is the same as

Y2 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences				
Partitioning to subtract without regrouping	<p>$36 - 12 =$</p>  <p>Using the Base ten.</p> <p>Make 36 and physically takeaway the 12.</p>	<p>Drawing base ten (Chips and Peas) and crossing them out.</p>  <p>$43 - 21 = 22$</p>	<p>Finding a part of whole part/ bar model and writing down the different facts.</p> <table border="1" data-bbox="1288 271 1691 359"> <tr> <td colspan="2">36</td> </tr> <tr> <td>12</td> <td>?</td> </tr> </table>	36		12	?	<p>Use Year 1 stem sentences.</p> <p>Ron/ Fred/ Lucy is correct/incorrect because....</p> <p>It should have been....</p> <p>The digits/ calculations are the same but...</p> <p>If I know $10 - 1 = 9$, I can work out $100 - 90 =$ _____</p>
36								
12	?							
Partitioning to subtract with regrouping	<p>$20 - 4 =$ _____</p>  <p>Exchange a stick of ten for ten ones.</p> <p>This could also be done with numicon.</p>	<p>Drawing pictures or to draw base ten in books.</p>  <p>$20 - 4 =$ _____</p>	<p>To subtract mentally or using a blank numberline to support.</p>	<p>True/ False because....</p> <p>We can partition 5 into 2 and 3 and use this to bridge the ten.</p> <p>I have to exchange _____ which will change the tens digit to _____.</p>				
Jump to ten (Progression should be crossing one ten, crossing more than one ten, crossing the hundred)	 <p>Use a bead bar or bead strings to model counting to next ten and the rest.</p>	 <p>Use your number facts to help you.</p>	<p>To use method mentally to answer questions such as:</p> <p>36 - 18</p>	<p>The most efficient method is _____</p> <p>Altogether they have _____</p> <p>The correct answer is _____ this could have been shown by _____</p>				

I know that $3 + 7 = 10$ so I know that $10 - 3 = 7$. Therefore, I know $40 - 3 = 37$

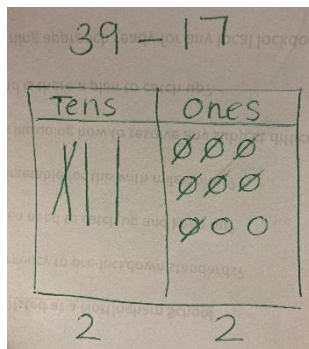
Column Subtraction
(Use this method without exchanging unless ready to do so).



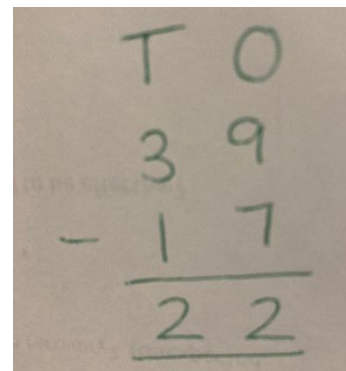
Use place value frames and use base ten/ numicon to support.

Representing the base ten pictorially (If crossing the tens boundary, remember to show the exchange)

$39 - 17 =$



Column method.



Vocabulary: New vocabulary for this year group is in red.

+, add, **addition**, more, plus make, sum, total altogether score double, near double one more, two more... ten more... **one hundred more** how many more to make...? how many more is... than...? how much more is...? -, subtract, **subtraction**, take (away), minus leave, how many are left/left over? one less, two less... ten less... **one hundred less** how many fewer is... than...? how much less is...? difference between half, halve =, equals, sign, is the same as **tens boundary**

Y3 Concrete

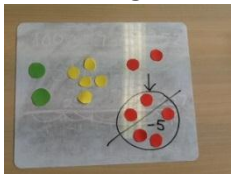
Pictorial

Abstract

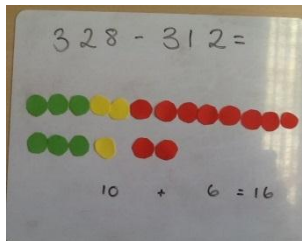
Examples of Stem Sentences

Add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens, a three-digit number and hundreds.

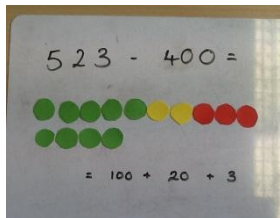
Use Place Value counters (or base 10) to represent the digits.



Continue to use 'find the difference' as a subtraction method, using counters to represent digits.

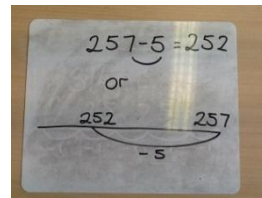


And 100s:

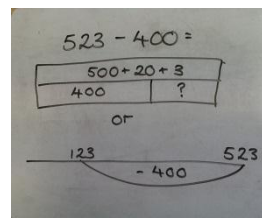
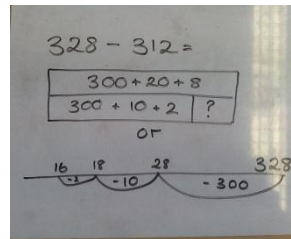


with

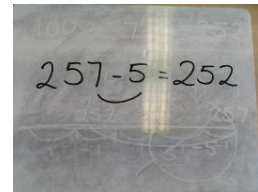
Use a number line to count back in jumps.



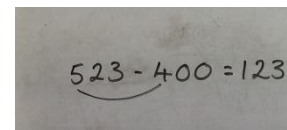
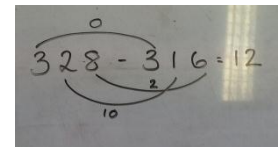
Use the bar model alongside a numberline to represent more complex numbers.



Use knowledge of number facts to solve the calculation.



Use knowledge of number facts to solve the calculation.



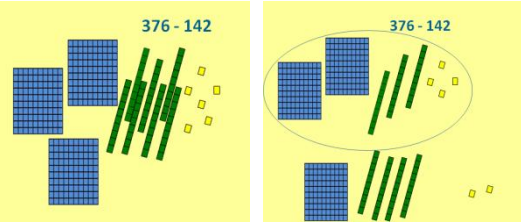
___ ones/tens/hundreds subtract
___ ones/tens/hundreds is equal
to ___ ones/tens/hundreds.

The whole minus (or subtract) a
part is equal to the difference.

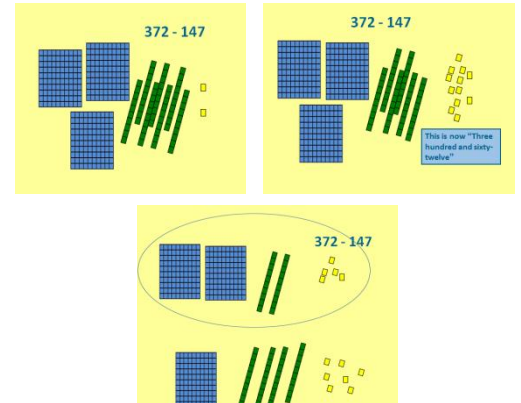
Subtract numbers with up to three digits, using formal written methods of columnar subtraction .

Use base 10 or Place Value Counters to represent the digits.

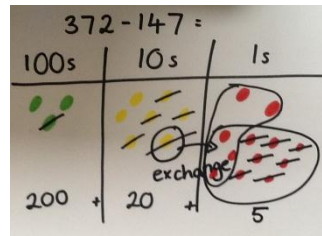
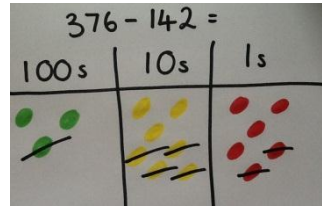
Without **exchange**:



With **exchange**:



Draw the manipulatives in their columns.
Cross out the ones to be subtracted.



Write out using expanded method (partitioning the digits) until children are confident.
Then introduce compact method.

$$\begin{array}{r} 300 + 70 + 6 \\ - 100 + 40 + 2 \\ \hline 200 + 30 + 4 \end{array}$$

or

$$\begin{array}{r} 376 \\ - 142 \\ \hline 234 \end{array}$$

$$\begin{array}{r} 300 + 70 + 2 \\ - 100 + 40 + 7 \\ \hline \text{Becomes} \\ 300 + 60 + 12 \\ - 100 + 40 + 7 \\ \hline 200 + 20 + 5 \end{array}$$

or

$$\begin{array}{r} 372 \\ - 147 \\ \hline 225 \end{array}$$

When we subtract, we start with the smallest value column.

___ ones/tens/hundreds subtract
___ ones/tens/hundreds is equal to ___ ones/tens/hundreds.

If the number I have is less than the number I need to subtract, I must exchange from the next column.

I will exchange 1 hundred for 10 tens.

I will exchange 1 ten for 10 ones.

Vocabulary: New vocabulary for this year group is in red.

-, subtract, subtraction, take (away), minus leave, how many are left/left over? one less, two less... ten less... one hundred less how many fewer is... than...? how much less is...? difference between half, halve =, equals, sign, is the same as, tens boundary, hundreds boundary.

Y4,5,6 Concrete	Pictorial	Abstract	Examples of Stem Sentences
-----------------	-----------	----------	----------------------------

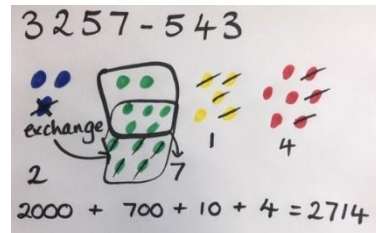
Year 4: Subtract numbers with up to 4 digits using the formal written method of columnar subtraction where appropriate.

Year 5 and Year 6: Subtract numbers with more than 4 digits using the formal written method of columnar subtraction. (The methods are identical but the number of digits increases).

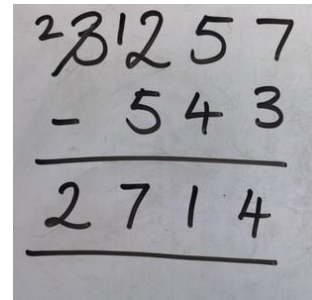
Children use Place Value counters to represent and manipulate the digits. Physically exchange where needed.



Pictorial representation of the concrete modelling, colours optional. Exchange is shown.



Children record calculations using the compact method, annotating to show exchange as shown.



If the number I have is less than the number I need to subtract, I must exchange from the next column.

I will exchange 1 thousand for 10 hundreds.

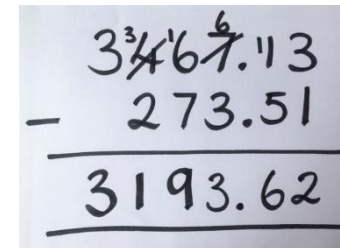
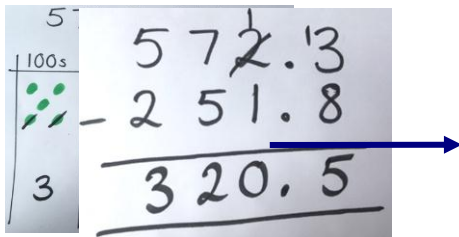
I will exchange 1 hundred for 10 tens.

I will exchange 1 ten for 10 ones.

I will exchange 1 one for 10 tenths.

I will exchange 1 tenth for 10 hundredths.

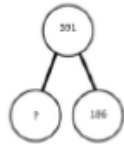
Decimals to be subtracted in the same way, decimal point included in the calculation. Concrete may not be needed by this point but can be represented pictorially, progressing to abstract.



Vocabulary: New vocabulary for this year group is in red.

-, subtract, subtraction, take (away), minus leave, how many are left/left over? one less, two less... ten less... one hundred less how many fewer is... than...? how much less is...? difference between half, halve =, equals, sign, is the same as tens boundary, hundreds boundary, inverse, units boundary, tenths boundary.

Conceptual Variation for Subtraction (different ways to ask children to solve the same calculation)



391	
186	?

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

Calculate the difference between 391 and 186.

$$\square = 391 - 186$$

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

What is 186 less than 391?

Missing digit calculations

$$\begin{array}{r} 39\square \\ -\square\square6 \\ \hline \square05 \end{array}$$

Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

GUIDANCE / MODELS AND IMAGES

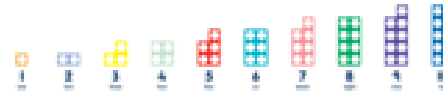
The link between addition and multiplication can be introduced through doubling.

If available, Numicon is used to visualise the repeated adding of the same number.

These can then be drawn around or printed as a way of recording.



Children begin with mostly pictorial representations:



How many groups of 2 are there?

Real life contexts and use of practical equipment to count in repeated groups of the same size:

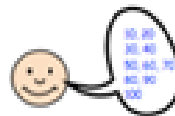


How many wheels are there altogether?



How much money do I have?

Count in twos; fives; tens both aloud and with



objects

Children are given multiplication problems set in a real life context. Children are encouraged to visualise the problem.

How many fingers on two hands? How many sides on three triangles? How many legs on four ducks?

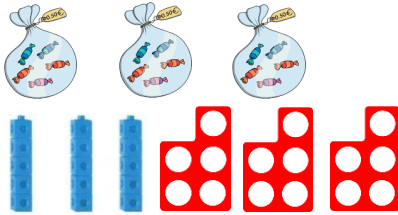
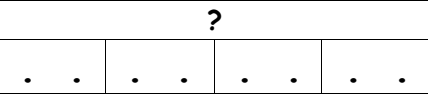
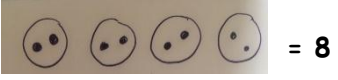
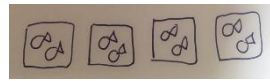

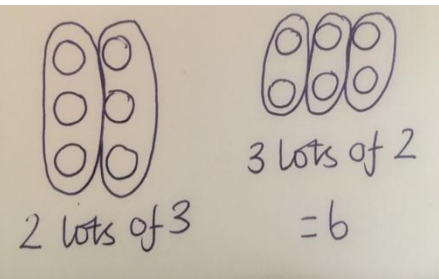
Children are encouraged to read number sentences aloud in different ways "five times two makes ten" "ten is equal to five multiplied by two"

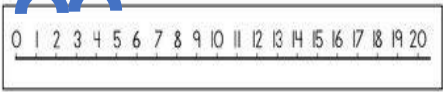
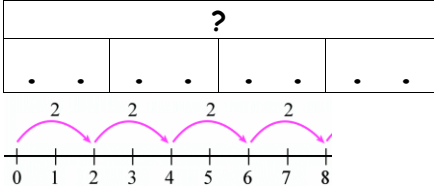
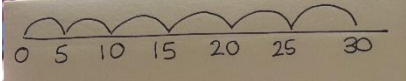
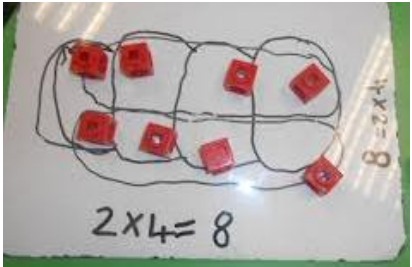
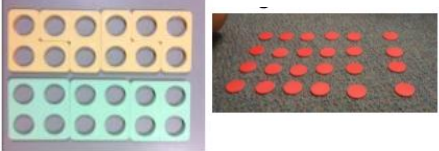
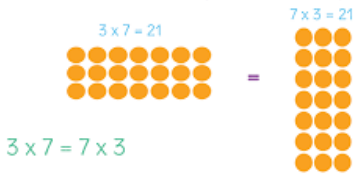
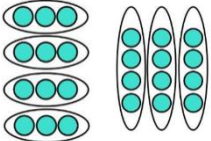

Vocabulary: *New vocabulary for this year group is in red.*

equally, one each, two each, three each... group in pairs,

lots of, groups of

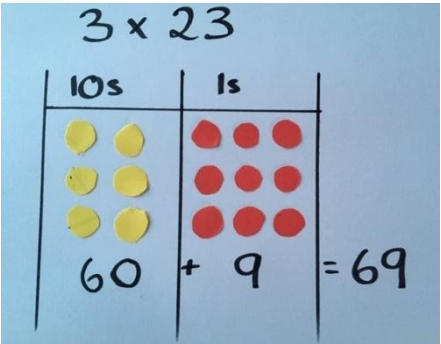
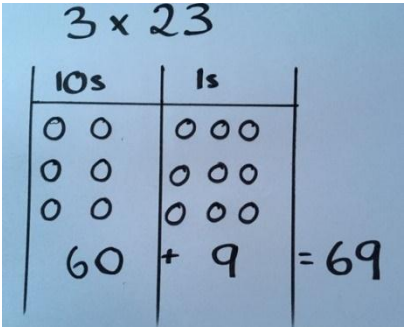
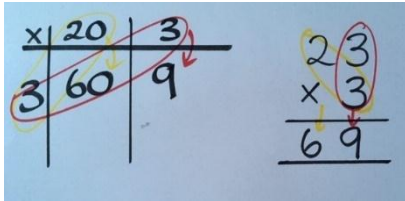
double

Y1 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences
<p>Counting in 2s, 5s and 10s (Repeated addition and grouping)</p>	<p>Using objects, counters, cubes, numicon, to represent repeated grouping.</p> <p>$3 \times 5 =$</p>  <p>$5 + 5 + 5 =$ There are 3 equal groups with 5 in each group.</p>	<p>To represent resources using pictures, bar models to solve problems.</p> <p>There are 2 fish in each tank. How many fish would there be in 4 tanks?</p>    <p>$2 \times 4 =$ $2 + 2 + 2 + 2 =$ There are 4 equal groups with 2 in each group.</p>	<p>There are 5 apples on each tree. There are 4 trees. How many apples altogether?</p> <p>$5 \times 4 =$</p> <p>5 10 15 20</p>	<p>_____ groups of _____ are equal to _____</p> <p>There are _____ groups of ten. There are _____ ones</p> <p>_____ groups of ten are equal to _____</p> <p>The pattern is increasing in _____</p>
<p>To understand arrays (in multiples of 2s, 5s and 10s)</p>	<p>Use real life objects in arrays and then move onto using counters and cubes.</p>  <p>Cars - 4 lots of 2/ 2 lots of 4 Eggs - 10 lots of 2/ 2 lots of 10 Let children explore how they are grouped and what multiples they could count in.</p>	<p>Drawing simple arrays.</p>  <p>2 lots of 3 3 lots of 2 = 6 = 6</p> <p>$2 \times 3 = 6$ $3 \times 2 = 6$</p>	<p>Children to use an array to work out calculations. 2×5 4×10 etc.</p>	
<p>Vocabulary: : New vocabulary for this year group is in red. lots of, groups of x, times, multiply, repeated addition array row, equally, one each, two each, three each... group in pairs, threes..., arrays, groups, double</p>				

Y2 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences
<p>Counting in multiples of 2, 3, 4, 5, 10 from 0 (repeated addition/grouping)</p>	<p>Same as Year 1 and numberlines to be used to show repeated groups/addition. +2 +2</p>  <p>$2 \times 2 =$ $2 + 2 =$</p> <p>There are 2 groups with 2 in each group. There are _____ altogether.</p>	<p>There are 2 fish in each tank. How many fish would there be in 4 tanks?</p>  <p>$2 \times 4 =$ $2 + 2 + 2 + 2 =$</p> <p>There are 4 equal groups with 2 in each group.</p>	<p>A blank numberline representing 6 jumps of 5.</p> <p>$6 \times 5 = 30$</p> 	<p>There are _____ parts with a value of _____. The whole is _____.</p> <p>_____ groups of _____ is equal to _____.</p> <p>When we multiply, the parts are known but the whole is unknown.</p> <p>_____ multiplied by _____ is equal to _____.</p>
<p>Use arrays to illustrate commutativity</p>	<p>Let the children explore that multiplication is commutative using arrays.</p>   <p>Pupils should understand that the order of the multiplication calculation does not affect the answer.</p>	<p>Use representations of arrays to show different calculations and explore commutativity.</p>  <p>$3 \times 7 = 7 \times 3$</p> <p>$4 \times 3 =$ $3 \times 4 =$</p> 	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>  <p>$5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$</p>	<p>Numbers in the multiplication table of _____ always _____</p>

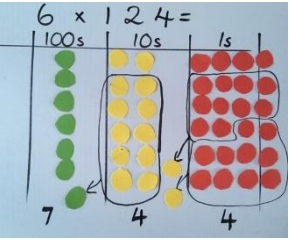
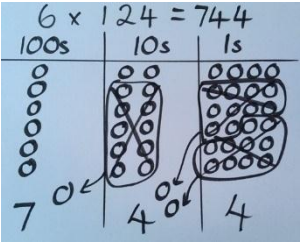
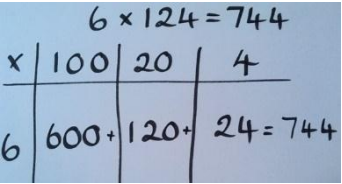
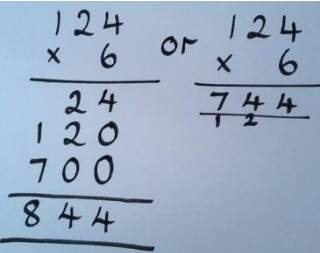
Vocabulary: : **New vocabulary for this year group is in red.**
lots of, groups of \times , times, multiply, multiplied by multiple of once, twice, three times... ten times... times as (big, long, wide... and so on) repeated addition array row, column double

Ks2

Yr 3 Concrete	Pictorial	Abstract	Examples of Stem Sentences
<p>Multiply two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.</p>			
<p>Children use Place Value counters to create an array showing '3 lots of 23'.</p> 	<p>The concrete array can be represented pictorially.</p> 	<p>Numbers are used to replace the counters, creating 'grid method'.</p>  <p>Children can progress to the formal written method when they confidently understand the relationships between the numbers.</p> <p>It is often useful to use both methods alongside each other when introducing the formal method.</p>	<p>___ x ___ is the same as ___ lots of ___ .</p> <p>___ multiplied by ___ is equal to ___ .</p> <p>___ is a multiple of ___ because ...</p>

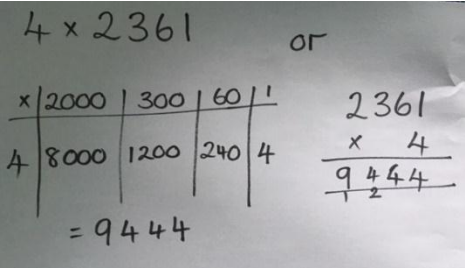
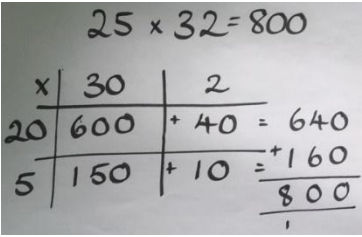
Vocabulary: New vocabulary for this year group is in red.

lots of, groups of x, times, multiply, multiplication, multiplied by multiple of, product once, twice, three times... ten times... times as (big, long, wide... and so on) repeated addition, array, row, column, double.

Y4 Concrete	Pictorial	Abstract	Examples of Stem Sentences
Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.			
<p>Children use arrays to model '6 lots of 124'. They physically exchange the counters across the boundaries.</p> 	<p>Represent the counters and arrays pictorially.</p> 	<p>Children use the grid method to partition and calculate before recombining.</p>  <p>Formal written layout, either expanded or compact depending on understanding, multiplying each number starting from the ones column.</p> 	<p>X lots of Y is equal to Y lots of X.</p> <p>This column's value is ____ which is greater than 10, so I exchange across.</p> <p>To make this 10 times bigger I must multiply by 10.</p>

Vocabulary: New vocabulary for this year group is in red.

lots of, groups of \times , times, multiply, multiplication, multiplied by multiple of, product once, twice, three times... ten times... times as (big, long, wide... and so on) repeated addition, array, row, column, double, exchange, compact, expanded.

Y5/6 Concrete	Pictorial	Abstract	Examples of Stem Sentences
<p>Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.</p>			
<p>By this point, concrete modelling and pictorial representations should not be needed as the methods essentially remain the same and the values become very large. However, if a child needs to use the manipulatives, continue as before.</p>	<p>Multiplying any number by a 1 digit number uses the same version of the grid method and compact formal method.</p>  <p>To multiply a 2 digit number by a 2 digit number using the grid method, partition, calculate then recombine.</p> 	<p>X lots of Y is equal to Y lots of X.</p> <p>This column's value is ____ which is greater than 10, so I exchange across.</p> <p>To make this 10 times bigger I must multiply by 10.</p>	

Expanded or 'Long' multiplication is needed to multiply 2, 3, 4 or more digits by a 2 digit number. Multiply each digit by the 'Ones' value first, then by the 'Tens', placing the answers underneath to create a column addition as shown in the following images:

$$\begin{array}{r} 32 \\ \times 25 \\ \hline 160 \\ 640 \\ \hline 800 \end{array}$$

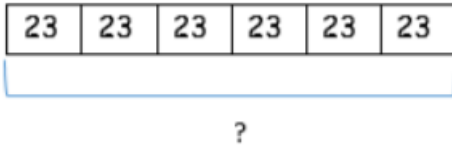
$$\begin{array}{r} 245 \\ \times 32 \\ \hline 490 \\ 7350 \\ \hline 7840 \end{array}$$

$$\begin{array}{r} 2623 \\ \times 43 \\ \hline 7269 \\ 104920 \\ \hline 112189 \end{array}$$

Vocabulary: New vocabulary for this year group is in red.

lots of, groups of x, times, multiply, multiplication, multiplied by multiple of, product once, twice, three times... ten times... times as (big, long, wide... and so on) repeated addition array row, column, double, exchange, compact, expanded, long method, formal method.

Conceptual Variation for Multiplication (different ways to ask children to solve the same calculation)



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

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

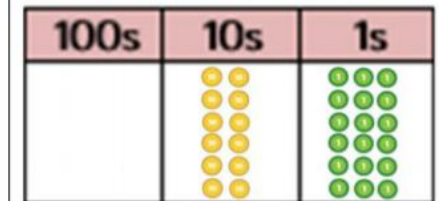
Find the product of 6 and 23

$$6 \times 23 =$$

$$\square = 6 \times 23$$

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

What is the calculation?
What is the product?



Division

Key language: share, group, divide, divided by, half.

GUIDANCE / MODELS AND IMAGES

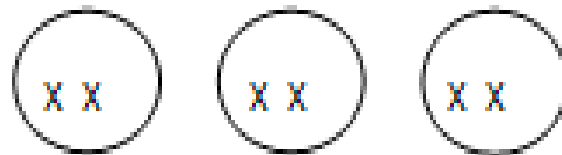
The ELG states that children solve problems, including doubling, halving and sharing.



Children need to see and hear representations of division as both grouping and sharing.

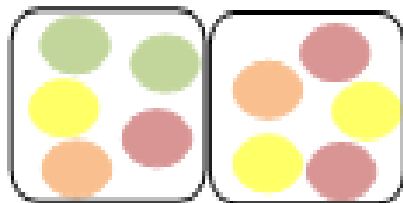
Division can be introduced through halving.

Children begin with mostly pictorial representations linked to real life contexts:



Grouping model

Mum has 6 socks. She grouped them into pairs – how many pairs did she make?



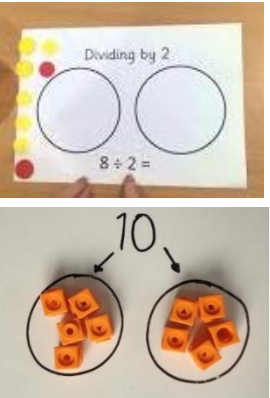
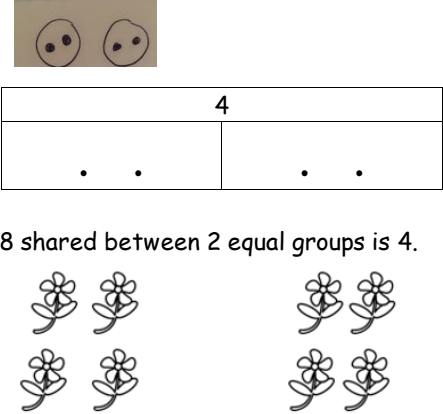
Sharing model

I have 10 sweets. I want to share them with my friend. How many will we have each?

Children have a go at recording the calculation that has been carried out.

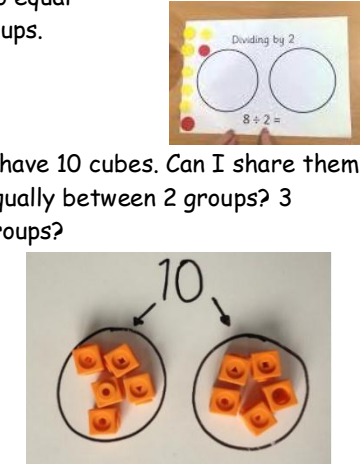
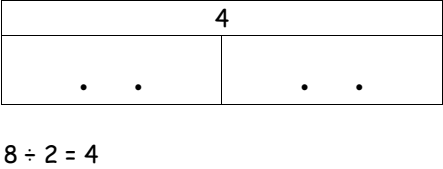
Vocabulary: New vocabulary for this year group is in red.


equally, one each, two each, three each... group in pairs, lots of, groups of, half, double, more, sum, total, altogether, double, one more, two more, ten more...

Y1 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences				
<p>Sharing 2s, 5s and 10s</p>	<p>Use a range of objects to share into equal groups.</p> 	<p>Represent the sharing using pictures. 4 shared between 2 equal groups equals 2.</p>  <p>8 shared between 2 equal groups is 4.</p>	<p>6 shared between 2 is</p> <table border="1" data-bbox="1285 236 1688 320"> <tr> <td colspan="2" style="text-align: center;">6</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> </tr> </table>	6		3	3	<p>_____ shared equally into groups of _____ makes _____ groups.</p> <p>I shared _____ into _____ equal groups. There are _____ in each group.</p> <p>The pattern is decreasing in _____</p> <p>There will be _____ in each group</p>
6								
3	3							

Vocabulary: New vocabulary for this year group is in red.

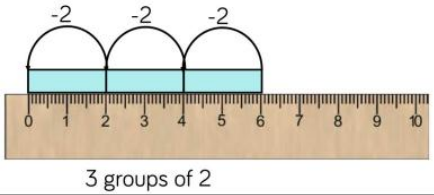
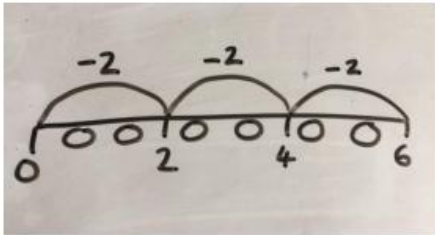
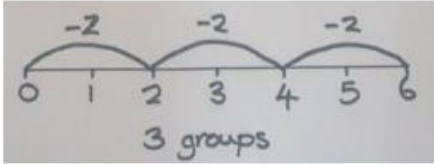
lots of, groups of \times , times, multiply, repeated addition array row, equally, one each, two each, three each... group in pairs, threes..., arrays, groups, double

Y2 Strategy	Concrete	Pictorial	Abstract	Examples of Stem Sentences
<p>Sharing 3s, 2s, 5s and 10s</p>	<p>Use a range of objects to share into equal groups.</p>  <p>I have 10 cubes. Can I share them equally between 2 groups? 3 groups?</p>	<p>Represent the sharing using pictures and using the bar model. $4 \div 2 = \dots$ 4 shared between 2 equal groups equals 2.</p>  <p>$8 \div 2 = 4$</p>	<p>Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables.</p>	<p>There are _____ parts with a value of _____. The whole is _____.</p> <p>_____ groups of _____ is equal to _____.</p> <p>_____ shared into _____ equal parts _____ is _____. _____ divided by _____ is equal to _____.</p> <p>When we divide, the whole is known and the number or parts or the value of the parts is unknown.</p> <p>_____ divided by _____ is equal to _____.</p>

		8 shared between 2 equal groups		
				


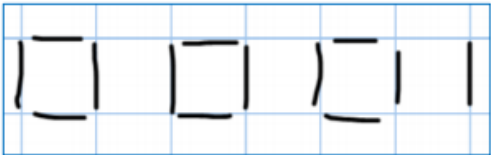
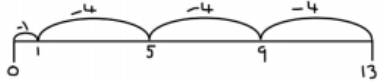
Vocabulary: : **New vocabulary for this year group is in red.**

lots of, groups of \times , times, multiply, multiplied by multiple of once, twice, three times... ten times... times as (big, long, wide... and so on) repeated addition array row, column double

Yr 3 Concrete	Pictorial	Abstract	Examples of Stem Sentences
Write and calculate mathematical statements for division using the multiplication tables that they know.			
<p>Division as repeated subtraction (making groups) Children can place Cuisenaire rods, or two-colour counters, above the numberline or ruler to show the groups.</p> 	<p>Represent on a number line with drawn counters, colours optional.</p> 	<p>A number line showing the groups made as jumps backwards to zero,</p> 	<p>My divisor is ___ so I make groups of that number.</p>

Vocabulary: New vocabulary for this year group is in red.

array row, column double, halve share, share equally one each, two each, three each, group in pairs, threes... tens equal groups of \div , divide, division, divided by, divided into left, left over, remainder

Yr 4 Concrete	Pictorial	Abstract	Examples of Stem Sentences
Divide leaving remainders.			
<p>Children model the calculation ($13 \div 4 =$) using manipulatives. Lolly sticks are shown here but two-colour counters can also be used.</p>  <p>There are 3 whole squares, with 1 left over.</p>	<p>Represent pictorially.</p> 	<p>Use a number line to show the groups and the remainder.</p> 	<p>There are ____ groups and ____ left over.</p>

Vocabulary: New vocabulary for this year group is in red.

array row, column double, halve share, share equally one each, two each, three each... group in pairs, threes... tens equal groups of divide, division, divided by, divided into remainder, factor, quotient, divisible by, inverse.

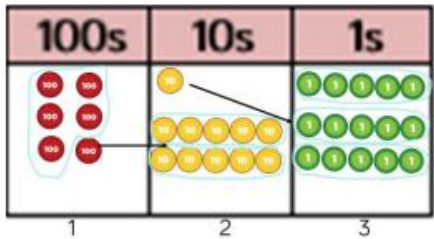
Yr 5 Concrete

Pictorial

Abstract

Examples of Stem Sentences

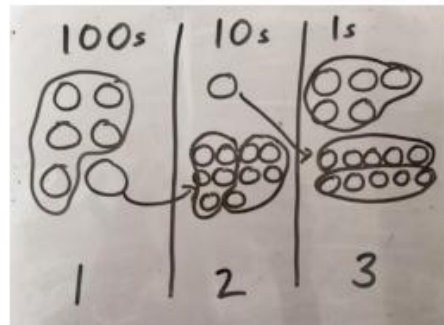
Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context



Short division using place value counters to group. $615 \div 5$ on a PV grid.

1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Represent the counters pictorially.



Show the calculation using the short method (bus stop).


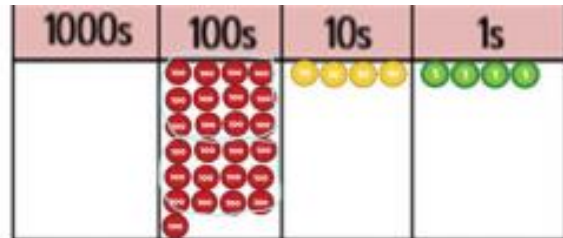
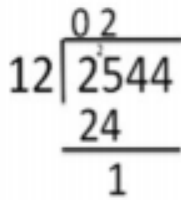
$$\begin{array}{r} 123 \\ 5 \overline{) 615} \end{array}$$

I can make ___ groups of ___.

I have ___ remaining so I exchange them into the next column.

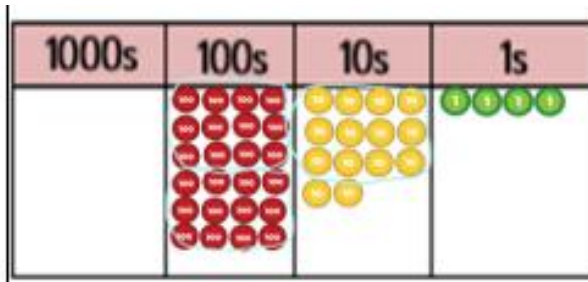
Vocabulary: New vocabulary for this year group is in red.

array row, column double, halve share, share equally, one each, two each, three each... group in pairs, threes... tens equal groups of divide, division, divided by, divided into remainder factor, quotient, divisible by inverse.

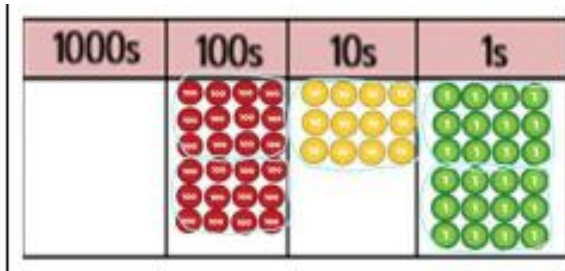
Yr 6 Concrete	Pictorial	Abstract	Examples of Stem Sentences
Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.			
<p>Long division using place value counters $2544 \div 12$</p>  <p>We can't group two 1000s into groups of 12 so we exchange them into</p>  <p>100s.</p>		<p>We the</p>  <p>begin abstract</p>	<p>I can make ____ groups of ____.</p> <p>I need to exchange the remaining ____.</p> <p>My remainder needs to exchange into the next column.</p>

representation:

We can now group 24 of the 100s into groups of 12 which leaves us with one 100.



After exchanging the hundreds, we have fourteen 10s. We can group twelve of the tens to make one group which leaves us two tens remaining.



After exchanging the two 10s, we have twenty four 1s. We can make two groups of 12, leaving none remainder.

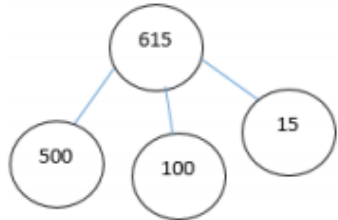
$$\begin{array}{r} 0212 \\ 12 \overline{) 2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

Vocabulary: New vocabulary for this year group is in red.

array row, column double, halve share, share equally, one each, two each, three each... group in pairs, threes... tens equal groups of divide, division, divided by, divided into remainder factor, quotient, divisible by inverse.

Conceptual Variation for Division (different ways to ask children to solve the same calculation)

Using the part whole model below, how can you divide 615 by 5 without using short division?



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

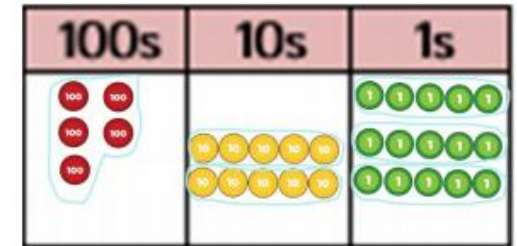
615 pupils need to be put into 5 groups. How many will be in each group?

$$5 \overline{)615}$$

$$615 \div 5 =$$

$$\square = 615 \div 5$$

What is the calculation?
What is the answer?



More Stem Sentences

Reasoning Stem sentences:

EYFS and Year 1

I know that because ____

My representation shows this because ____

The calculation which represents this is ____

I chose this strategy because ____

I will use the ____ strategy to ____

Year 2:

I know that because ____

My picture shows this because ____

The calculation which represents this is ____

I have spotted that ____

This is the same because ____.

This is different because ____.

Year 3:

I know that because ____.

I solved this problem by ____.

The calculation which represents this is ____.

It is simpler if we ____.

This is the same because ____.

This is different because ____.

Year 4:

I know that because ____.

I solved this problem by ____.

My representation shows ____.

The calculation which represents this is ____.

It is simpler if we ____.

This is the same because ____.

This is different because ____.

This is true here because ____.

Year 5:

This is true because ____.

I can prove this by ____.

The strategy I used was ____.

Another strategy I could use is ____.

Year 6:

I agree with __ because ____.

I made a connection with ____ because ____.

The first thing I did was ____.

First, then, next, after that...

I chose this strategy because ____ .

