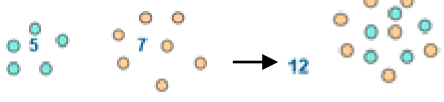
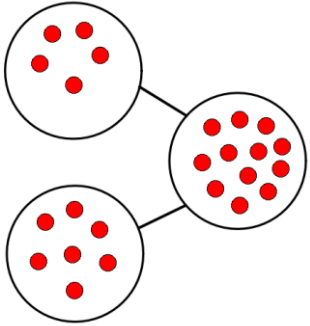
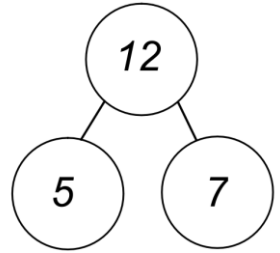
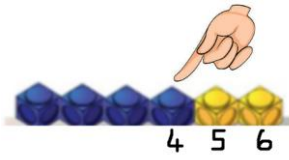

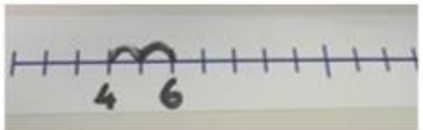




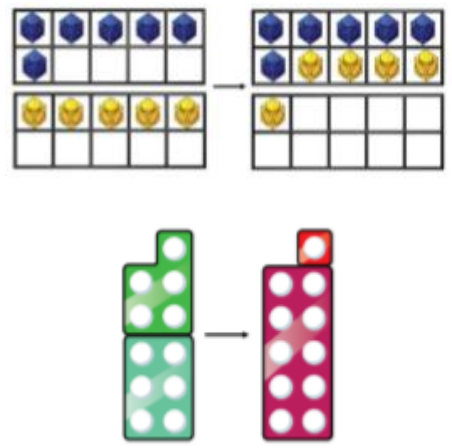
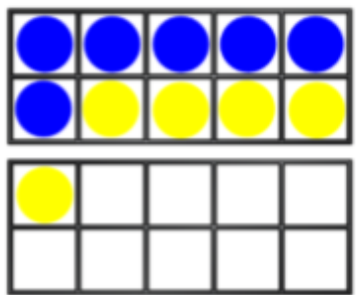
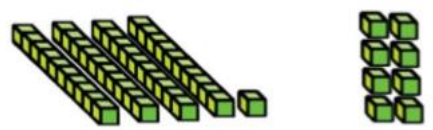
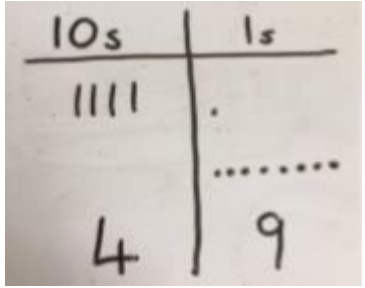
# Written Calculation Policy

Sep '21

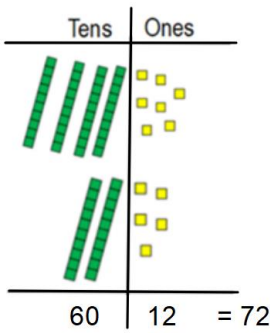
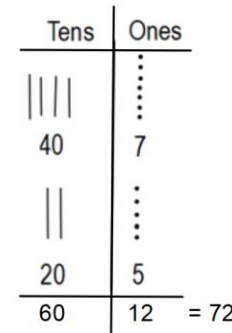
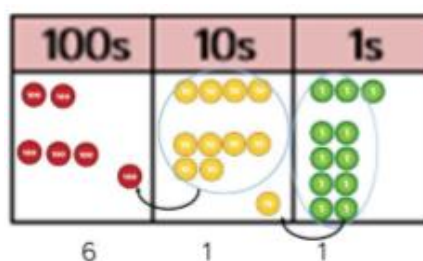
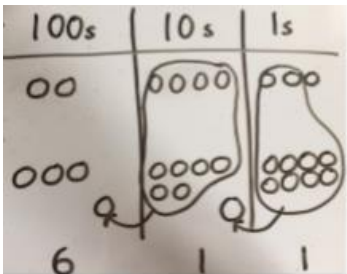
# + Addition

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Year 1</b></p> <p>Vocabulary: sum, total, plus, add, together, more, parts and wholes, 'is equal to', 'is the same as'</p>	<p><b>Combine two parts to make a whole</b> Combining two sets of objects (aggregation)</p> 	<p>Represent objects as <b>dots/crosses within a part-whole diagram.</b></p> 	<p><math>4 + 3 = 7</math> <math>7 = 4 + 3</math></p>  <p>Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.</p>
	<p>Progress onto adding on to a set (augmentation):</p> <p>Encourage children to <b>count on, rather than count all.</b></p> 	<p><b>Counting on with a given number line or number track</b></p> 	<p><b>Missing numbers</b></p> <p>Missing numbers need to be placed in all possible places.</p> <p><math>2 + 4 = \square</math>      <math>\square = 2 + 4</math>  <math>4 + \square = 6</math>      <math>6 = \square + 2</math></p> <p>Encourage children to use an <b>empty number track.</b></p> 

# + Addition

	Concrete	Pictorial	Abstract								
<p><b>Year 1 continued...</b></p>	<p><u>Regrouping to make 10</u> Using tens frames or Numicon e.g. <math>6 + 5</math></p>  <p>The image shows two methods of representing the addition 6 + 5. The top method uses two tens frames. The first frame has 6 blue dots (5 in the top row, 1 in the bottom left) and the second has 5 yellow dots (5 in the top row). An arrow points to a second set of frames where the 1 blue dot from the first frame and 1 yellow dot from the second frame are combined to form a 10-dot Numicon block (green and red), and the remaining 5 blue and 4 yellow dots are placed in another frame. The bottom method shows two Numicon blocks: a green 6-dot block and a red 5-dot block, with an arrow pointing to a single purple 11-dot block.</p>	<p>Children to draw onto a ten frame.</p>  <p>The image shows a ten frame with 6 blue dots in the top row and 5 yellow dots in the bottom row. Below it is another ten frame with 1 yellow dot in the top left corner and the rest empty.</p>	<p>Develop an understanding of <u>equality</u>.</p> <p>e.g. <math>6 + 5 = 10 + 1</math></p> <p>Moving onto <u>missing numbers</u>:</p> $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$								
<p><b>Year 2</b></p> <p>Vocabulary: sum, total, plus, add, together, more, parts and wholes, 'is equal to', 'is the same as'</p>	<p><u>TO + O using base 10 equipment.</u></p>  <p>The image shows base 10 equipment representing 40 + 9. On the left, there are four ten rods and one one unit. On the right, there are four ten rods and nine one units.</p>	<p>Children to draw representations</p>  <p>The image shows a hand-drawn diagram with a vertical line separating '10s' and '1s'. On the left, there are four vertical bars representing tens and one small dot representing one. On the right, there are four vertical bars representing tens and nine small dots representing ones. Below the diagram, the number 4 is written under the tens column and 9 is written under the ones column.</p>	<p><u>Expanded column addition.</u></p> <table border="1" style="display: inline-table; vertical-align: middle;"> <thead> <tr> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>40</td> <td>1</td> </tr> <tr> <td></td> <td>8</td> </tr> <tr> <td>40</td> <td>9</td> </tr> </tbody> </table> <p style="text-align: right;">= 49</p>	Tens	Ones	40	1		8	40	9
Tens	Ones										
40	1										
	8										
40	9										

# + Addition

	Concrete	Pictorial	Abstract																												
<b>Year 2 continued...</b>	TO + TO using base 10 equipment. $47 + 25$ 	Represent base 10 using pictures. 	<u>Expanded column addition</u> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">T</td> <td style="text-align: center;">O</td> <td></td> </tr> <tr> <td style="text-align: center;">40</td> <td style="text-align: center;">7</td> <td></td> </tr> <tr> <td style="text-align: center;">20</td> <td style="text-align: center;">5</td> <td></td> </tr> <tr> <td style="text-align: center;">60</td> <td style="text-align: center;">12</td> <td style="text-align: center;">= 72</td> </tr> </table>	T	O		40	7		20	5		60	12	= 72																
T	O																														
40	7																														
20	5																														
60	12	= 72																													
<b>Year 3</b> Vocabulary: sum, total, plus, add, together, more, parts and wholes, 'is equal to', 'is the same as'	HTO + HTO using base 10 equipment or place value counters. 	Represent base 10 or place value counters with pictures. 	<u>Expanded column addition</u> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">H</td> <td style="text-align: center;">T</td> <td style="text-align: center;">O</td> <td></td> </tr> <tr> <td style="text-align: center;">200</td> <td style="text-align: center;">40</td> <td style="text-align: center;">3</td> <td></td> </tr> <tr> <td style="text-align: center;">300</td> <td style="text-align: center;">60</td> <td style="text-align: center;">8</td> <td></td> </tr> <tr> <td style="text-align: center;">500</td> <td style="text-align: center;">100</td> <td style="text-align: center;">11</td> <td style="text-align: center;">=611</td> </tr> </table> <p>Progressing to:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">H</td> <td style="text-align: center;">T</td> <td style="text-align: center;">O</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">4</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">6</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> </tr> </table>	H	T	O		200	40	3		300	60	8		500	100	11	=611	H	T	O	2	4	3	3	6	8	6	1	1
H	T	O																													
200	40	3																													
300	60	8																													
500	100	11	=611																												
H	T	O																													
2	4	3																													
3	6	8																													
6	1	1																													
<b>Year 4, 5 &amp; 6</b> As above	As above, using larger numbers.	As above, using larger numbers.	As above, using larger numbers.																												

# - Subtraction

Yr Grp & Vocabulary

Concrete

Pictorial

Abstract

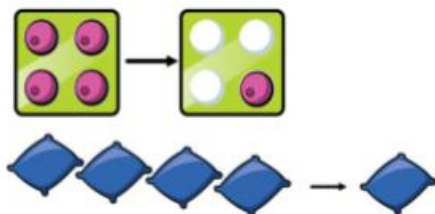
**Year 1**

Vocabulary:

Subtraction, subtract, take away, distance between, difference between, more than, minus, less than, equals = same as, most, least, pattern, odd, even, digit

**Physically taking away and removing physical objects from a whole** (tens frames, Numicon, cubes and other items such as beanbags could be used )

$$4 - 3 = 1$$

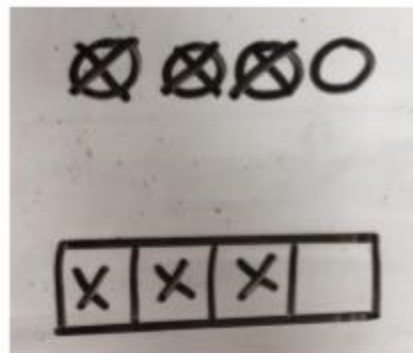


**Counting back** (using number lines or number track as support) children start with 6 and count back 2)

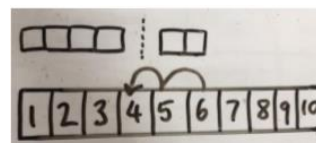
$$6 - 2 = 4$$



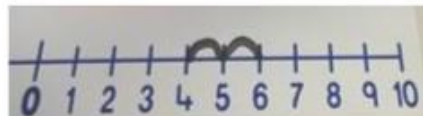
Children to draw the concrete resources they are using and cross out the correct amount. The bar model can be used.



Children to represent what they see pictorially e.g.



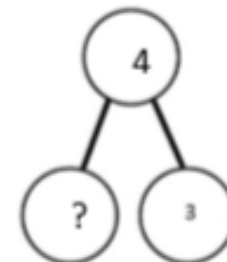
Use a given number line or number track.



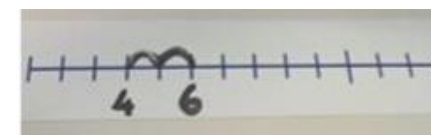
**Part-whole diagram and equality**

$$4 - 3 =$$

$$\square = 4 - 3$$



Encourage children to use an empty number line.



# - Subtraction

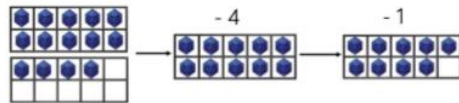
Year 1 continued..

Concrete

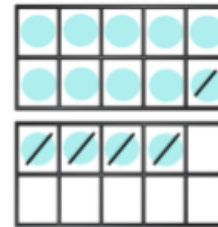
Pictorial

Abstract

**Making 10** using ten frames.  
14 - 5



Children to present the tens frame pictorially and discuss what they did to make 10.



Children to show how they can make 10 by partitioning the subtrahend.

$$14 - 5 = 9$$

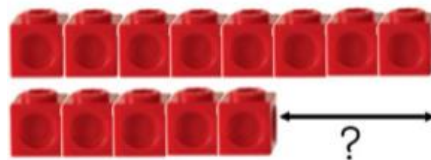
$$\begin{array}{c} 4 \quad 1 \end{array}$$

$$14 - 4 = 10$$

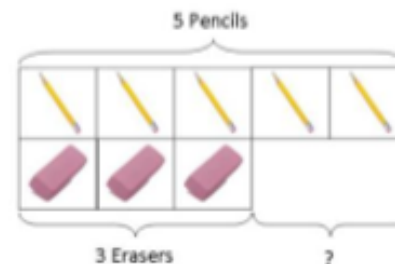
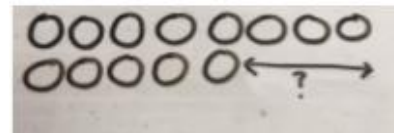
$$10 - 1 = 9$$

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

Calculate the difference between 8 and 5.



Children to draw the cubes/other concrete objects which they have used to illustrate what they need to calculate.



Find the difference between 8 and 5.  
8 - 5, the difference is \_\_\_\_

Children to explore why  $9 - 6 = 8 - 5 = 7 - 4$  have the same difference.

# - Subtraction

## Yr Grp & Vocabulary

**Year 2**

Vocabulary:

Subtraction, subtract, take away, difference, difference between, minus  
Tens, ones, partition  
Near multiple of 10, tens boundary  
Less than, one less, two less...  
ten less... one hundred less

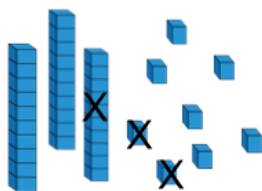
## Concrete

Use partitioning of tens and ones to subtract a 2 digit number from another 2 digit number with no regrouping involved.

$$37 - 12 =$$

$$37 - 10 = 27$$

$$27 - 2 = 25$$



## Pictorial

Children to present the 2 digit number using a pictorial image.

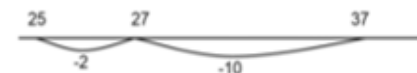
$$37 - 12 \text{ ( subtract 10, subtract 2 )} = 25$$



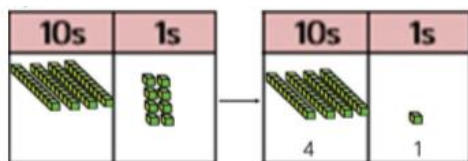
## Abstract

Children to use a number line to show partitioning of the 2 digit number 10 and 2, then to subtract this from 37 separately.

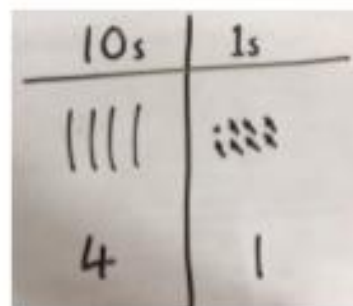
$$37 - 12 =$$



Column method using base 10.  
48-7



Children to represent the base 10 pictorially where no renaming is required



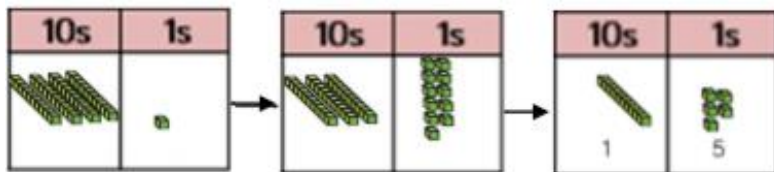
Children to use the expanded form of column subtraction.

T	O	
40	8	
-	7	
40	1	= 41

# - Subtraction

**Year 2  
continued...**

**Vocabulary:  
Renaming**



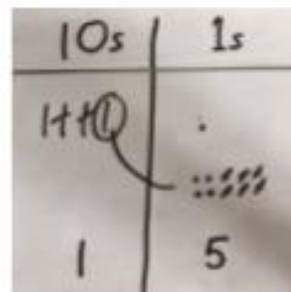
**Concrete**

**Column method** using base 10 and having to rename.

41-26

**Pictorial**

Represent the base 10 pictorially, remembering to show the renaming.



**Abstract**

Expanded column method

$$\begin{array}{r|l}
 \text{T} & \text{O} \\
 \hline
 & 11 \\
 - & 26 \\
 \hline
 30 & \\
 \cancel{40} & \\
 \hline
 10 & 5 = 15
 \end{array}$$

Progressing to the formal column method when ready. Children must understand that when they have renamed the 10 they still have 41 because  $41 = 30 + 11$ .

$$\begin{array}{r|l}
 & 1 \\
 - & 26 \\
 \hline
 & 15
 \end{array}$$

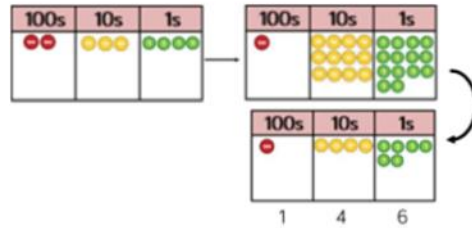
# - Subtraction

## Year 3

Vocabulary:  
 Hundreds, tens, ones, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, rounding, column subtraction, **rename**  
 See also Y1 and Y2

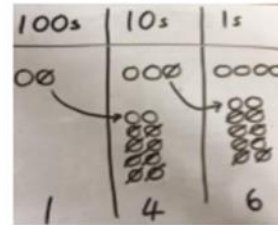
### Concrete

Column method using place value counters.  
 234-88



### Pictorial

Represent the place value counters pictorially; remembering to show what has been renamed.



### Abstract

Expanded column method

$$\begin{array}{r|c|c}
 \text{H} & \text{T} & \text{O} \\
 \hline
 \overset{100}{\cancel{200}} & \overset{120}{\cancel{30}} & 14 \\
 - & 80 & 8 \\
 \hline
 100 & 40 & 6 = 146
 \end{array}$$




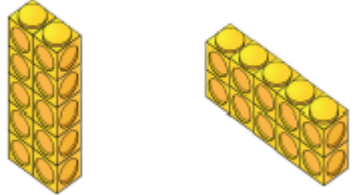

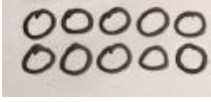
Formal column method. Children must understand what has happened when they have crossed out digits.

$$\begin{array}{r|c|c}
 \text{H} & \text{T} & \text{O} \\
 \hline
 \overset{1}{\cancel{2}} & \overset{12}{\cancel{3}} & 14 \\
 - & 8 & 8 \\
 \hline
 1 & 4 & 6 = 146
 \end{array}$$

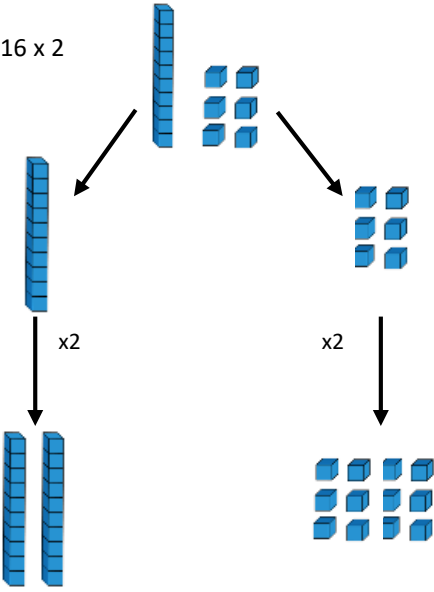
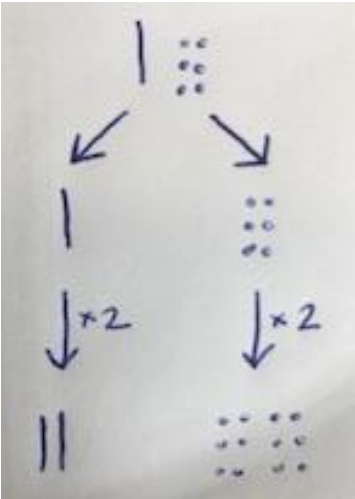
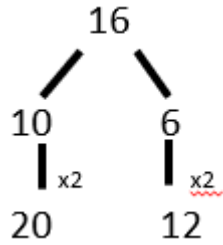
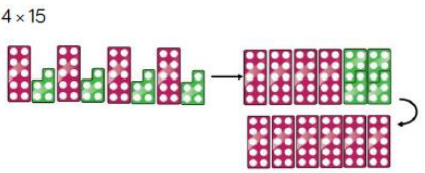
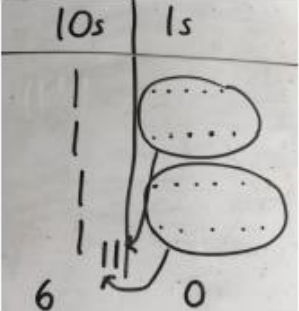
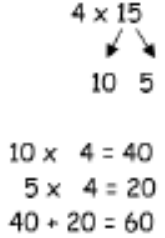
Continue to follow concrete, pictorial and abstract model from Year 3 to meet the needs of each specific year group.

Years 4, 5 and 6


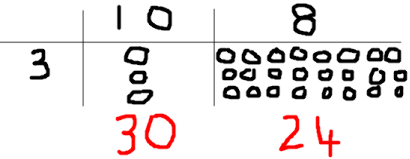
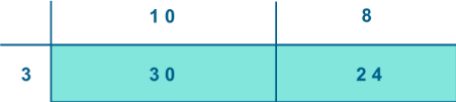
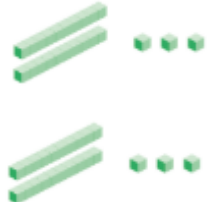
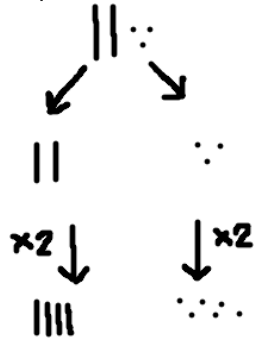
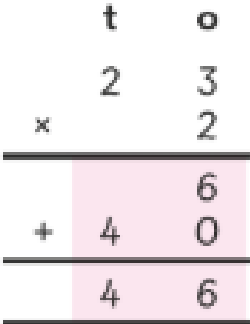

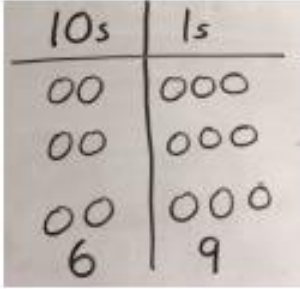
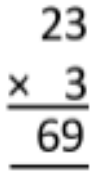
# x Multiplication

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Year 1</b></p> <p><b>Vocabulary:</b> multiplication, lots of, groups of, double, arrays, repeated addition</p>	<p><b>Repeated grouping/repeated addition</b> Washing line, and other practical resources for counting. Concrete objects. Numicon; bundles of straws, bead strings etc</p> 	<p>Children to represent the practical resources in a picture and using a number line</p> 	<p><math>2 \times 5 = 10</math></p> <p><math>2 + 2 + 2 + 2 + 2 = 10</math></p> <p>2 multiplied by 5</p> <p>5 pairs</p> <p>5 jumps of 2</p> <p>Abstract number line showing 5 jumps of 2</p> 
	<p><b>Use arrays</b> to understand multiplication can be done in any order (commutative). Counters and other objects can be used</p> <p><math>2 \times 5 = 5 \times 2</math></p>  <p>2 lots of 5      5 lots of 2</p>	<p>Children to represent the arrays pictorially</p>  <p><math>2 \times 5 = 10</math></p> <p><math>5 \times 2 = 10</math></p>  <p><math>5 \times 2 = 10</math></p> <p><math>2 \times 5 = 10</math></p>	<p><math>2 \times 5 = 10</math></p> <p><math>5 \times 2 = 10</math></p> <p><math>10 = 2 \times 5</math></p> <p><math>10 = 5 \times 2</math></p> <p><math>2 + 2 + 2 + 2 + 2 = 10</math></p> <p><math>5 + 5 = 10</math></p>

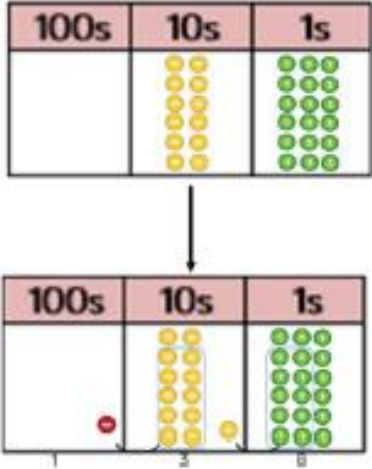
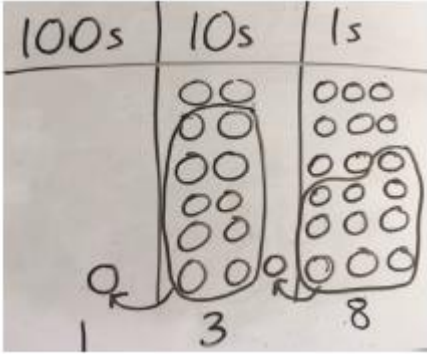
# x Multiplication

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Continue to build on the understanding of Year 1 strategies and vocabulary</b></p> <p><b>Year 2</b></p> <p>Vocabulary: facts, odd, even, commutative, inverse</p>	<p><b>Doubling</b> - begin to develop an understanding doubling of 2 digit numbers up to 50</p> <p>16 x 2</p> 	<p>Children <b>may</b> start to represent the materials pictorially</p> 	<p>Begin to use jottings <b>towards</b> recording the written method</p> 
<p><b>Continue to build on the understanding of Year 2 strategies and vocabulary</b></p> <p><b>Year 3</b></p> <p>Vocabulary: scaling</p>	<p><b>Partition to multiply</b> using Numicon, base 10 or Cuisenaire rods</p> <p>4 x 15</p> 		<p>Children to be encouraged to show the steps they have taken</p> 

# x Multiplication

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Year 3 continued...</b></p>	<p><b>Grid method</b> using place value counters or base 10</p> <p>18 x 3</p> 		
	<p><b>Being to use expanded column method (long multiplication)</b> using place value counters or base 10</p> <p>23x2</p> 		
	<p><b>Begin to use formal column method (short multiplication)</b> with place value counters or base 10</p> <p>3x23</p> 		<p>Record what is being done to show understanding</p> <p> <math>3 \times 23</math>  <math>20 \quad 3</math> </p> <p> <math>3 \times 20 = 60</math>  <math>3 \times 3 = 9</math>  <math>60 + 9 = 69</math> </p> 

# x Multiplication

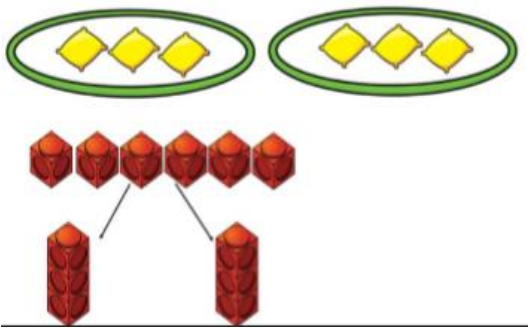
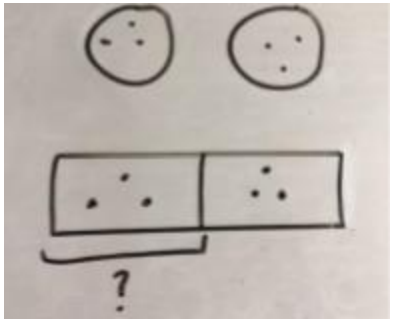

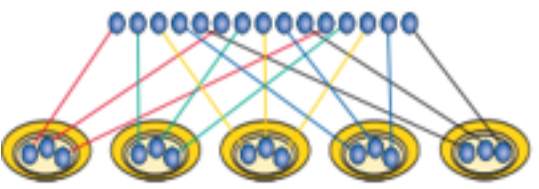
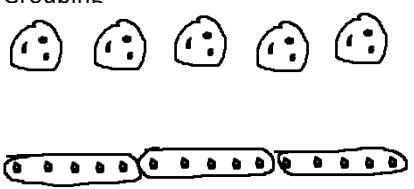
Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Continue to build on the understanding of Year 3 strategies and vocabulary</b></p> <p><b>Year 4</b></p> <p>Vocabulary: associative law, distributive law</p>	<p>Formal column method (short multiplication) with place value counters or base 10</p> <p>6x23</p> 		<p>Formal written method</p> $6 \times 23 =$ $\begin{array}{r} 23 \\ \times 6 \\ \hline 138 \\ \hline 11 \end{array}$

**Year 5 and Year 6** – continue to build on and deepen the understanding of strategies and vocabulary in previous years. When children start to multiply 3 digit x 3 digit and 4 digit x 2 digit (including decimals) they should be confident with the abstract (formal written methods).

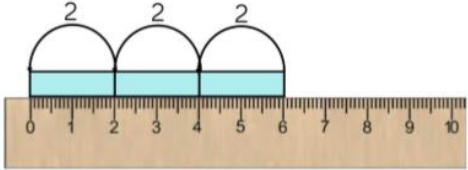
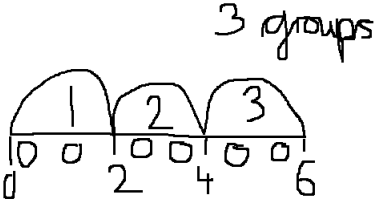
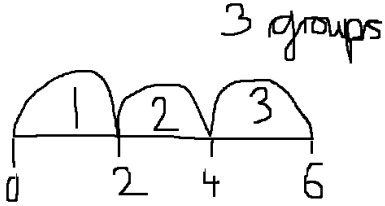
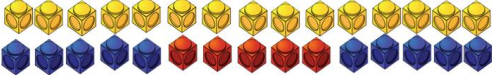

Vocabulary: multiple, factor, prime number, prime factor, composite number, square number, cubed number, equivalence, powers

X	1000	300	40	2	$\begin{array}{r} \phantom{0}^2 \phantom{0}^3 \phantom{0}^1 \\ 1342 \\ \times 18 \\ \hline 10736 \\ 13420 \\ \hline 24156 \\ \hline 1 \end{array}$
10	10000	3000	400	20	
8	8000	2400	320	16	


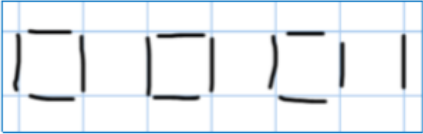
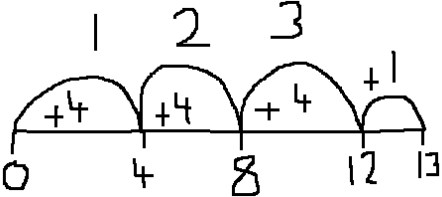
# ÷ Division

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Year 1</b></p> <p>Vocabulary: share, share equally, one each, two each..., group, groups of, lots of, array</p>	<p>Sharing using a range of objects <math>6 \div 2</math></p>  <p>The image shows two groups of three yellow diamonds, each enclosed in a green oval. Below this, six red cubes are arranged in a single row. Two lines connect the first and second cubes to a single cube below them, and another two lines connect the third and fourth cubes to another single cube below them, illustrating the process of grouping six items into two groups of three.</p>	<p>Represent the sharing pictorially.</p>  <p>The image shows two hand-drawn circles, each containing three dots. Below them is a hand-drawn bar model divided into two equal sections, each containing three dots. A bracket is drawn under the first section with a question mark below it, representing the unknown quotient.</p>	<p><math>6 \div 2 = 3</math></p>  <p>The image shows a simple bar model divided into two equal sections, each containing the number 3.</p> <p>Children should also be encouraged to use their 2 times table facts.</p>
	<p><b>Group AND share small quantities- understanding the difference between the two concepts.</b> <b>Sharing</b></p> <p>Develops importance of one-to-one correspondence.</p> <p><math>15 \div 5 = 3</math> 15 shared between 5</p>  <p>The image shows 15 blue dots arranged in a horizontal line. Five lines connect these dots to five yellow circles below. Each circle contains three dots, and the connections show that each dot is shared by one of the five groups, illustrating one-to-one correspondence.</p>	<p>Children to draw grouping and sharing small quantities.</p> <p><math>15 \div 5 = 3</math> Sharing</p> <p>Grouping</p>  <p>The image shows five hand-drawn houses, each with two windows. Below them is a hand-drawn bar model divided into three equal sections, each containing five dots, representing the quotient 3.</p>	

# ÷ Division

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Year 1/2</b></p>	<p>Count how many groups go in to the dividend.  <math>6 \div 2</math></p>  <p>3 groups of 2</p>	<p>Children to represent counting how many groups go in to the dividend</p>  <p>3 groups</p>	<p>Abstract number line to represent that equal groups that have been counted.</p>  <p>3 groups</p>
<p><b>Year 2</b></p> <p>Vocabulary:  group in pairs,  3s ... 10s etc  equal groups of  divide, ÷,  divided by,  divided into,  remainder</p>	<p>Use of cubes to illustrate the whole- and parts of division.</p> 	<p>Use the bar model to show grouping.</p> 	

# ÷ Division

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract			
<p><b>Year 3</b></p> <p>Vocabulary: Inverse group, groups of, lots of, array, group in pairs, 3s ... 10s etc equal groups of divide, ÷, divided by, divided into, remainder</p>	<p>TO ÷ O with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used . <math>13 \div 4 =</math></p>  <p>Use of lollipops sticks to form wholes- squares are made because we are dividing by 4. There are 3 whole squares, with 1 left over.</p>	<p>Children to represent the lollipop sticks pictorially.</p>  <p>There are 3 whole squares, with 1 left over.</p>	<p><math>13 \div 4 = 3</math> remainder 1</p> <p>Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.</p> <p>'3 groups of 4, with 1 left over'</p> 			
	<p>Using grouping to become more efficient at dividing larger numbers.</p>	<p>Use grouping on a bar model.</p> <table border="1" data-bbox="996 979 1387 1093"> <tr> <td colspan="2" style="text-align: center;"><b>48</b></td> </tr> <tr> <td style="text-align: center;">40 (10 groups)</td> <td style="text-align: center;">8 (2 groups)</td> </tr> </table> <p><math>48 \div 4 = 12</math></p>	<b>48</b>		40 (10 groups)	8 (2 groups)
<b>48</b>						
40 (10 groups)	8 (2 groups)					

# ÷ Division

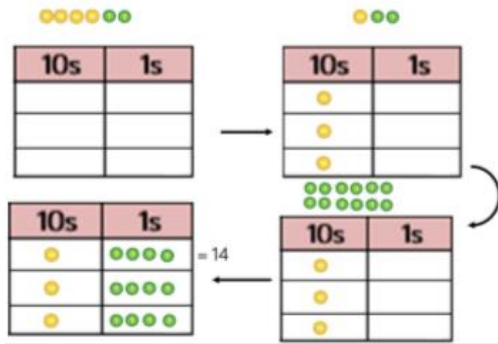
## Yr Grp & Vocabulary

### Year 4

#### Vocabulary:

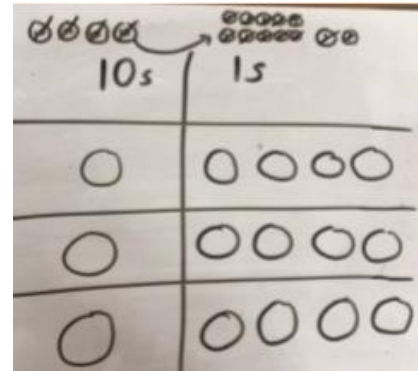
divide, divided by, divisible by, divided into share between, groups of factor, factor pair, multiple times as (big, long, wide ...etc) equals, remainder, quotient, divisor inverse

Sharing using place value counters.  
 $42 \div 3 = 14$



## Pictorial

Children to represent the place value counters pictorially.



## Abstract

Children to be able to make sense of the place value counters and write calculations to show the process.

$$42 \div 3$$

$$40 = 30 + 10$$

$$30 \div 3 = 10$$

$$12 \div 3 = 4$$

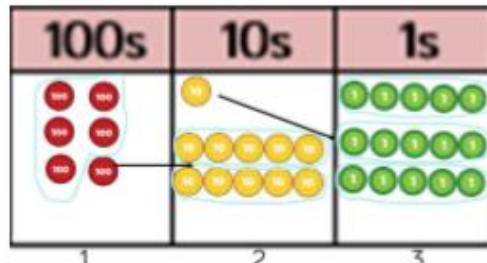
$$10 + 4 = 14$$

### Year 5

#### Vocabulary:

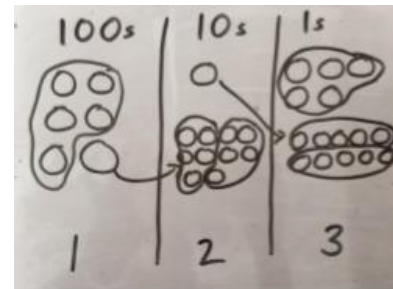
divide, divided by, divisible by, divided into share between, groups of factor, factor pair, multiple times as (big, long, wide ...etc) equals, remainder, quotient, divisor inverse

Short division using place value counters to group.  
 $615 \div 5$



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

Represent the place value counters pictorially.



## Short division

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

# ÷ Division

Yr Grp & Vocabulary	Concrete	Pictorial	Abstract
<p><b>Year 6</b></p> <p>Vocabulary:</p> <p>divide, divided by, divisible by, divided into, share between, groups of, factor, factor pair, multiple times as (big, long, wide ...etc)</p> <p>equals, remainder, quotient, divisor, inverse</p>		<p>We can't group 2 thousands into groups of 12 so exchange them.</p> <p>We can group 24 hundreds into groups of 12 which leaves 1 hundred.</p> <p>After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.</p> <p>After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 groups of 12, which leaves no remainder.</p>	<p>Children should write a list of key facts before calculating.</p> <p>24 48 60 72 84 96</p> $12 \overline{) 2544} \begin{matrix} 02 \\ \phantom{0}1 \\ \phantom{0}2 \end{matrix}$ $12 \overline{) 2544} \begin{matrix} 021 \\ \phantom{0}1 \\ \phantom{0}2 \end{matrix}$ $12 \overline{) 2544} \begin{matrix} 0212 \\ \phantom{0}1 \\ \phantom{0}2 \end{matrix}$

# ÷÷ Division

## Yr Grp & Vocabulary

## Abstract

Year 6 continued...

Chunking for long division:

Children write a list of key facts before calculating.

$$\begin{array}{r}
 97 \overline{) 8827} \\
 \underline{- 7760} \quad (80x) \\
 1067 \\
 \underline{- 970} \quad (10x) \\
 97 \\
 \underline{- 97} \quad (1x) \\
 0
 \end{array}$$

$$\begin{array}{l}
 97 \\
 194 \quad (2x) \\
 291 \quad (3x) \\
 388 \quad (4x) \\
 485 \quad (5x) \\
 970 \quad (10x) \\
 1940 \quad (20x) \\
 3880 \quad (40x) \\
 7760 \quad (80x)
 \end{array}$$