

# Ferham Primary School Calculation Policy

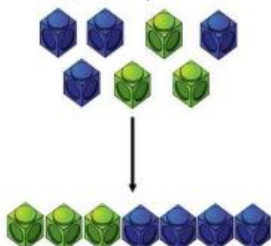
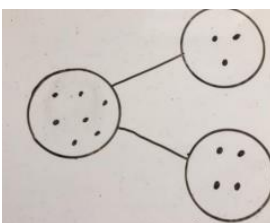
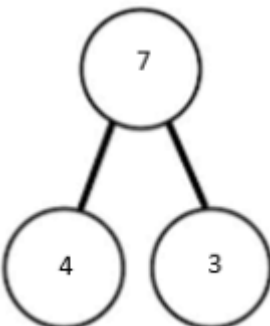
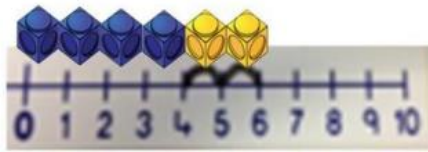
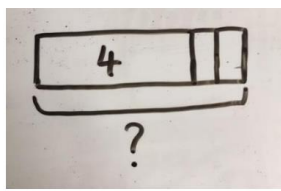
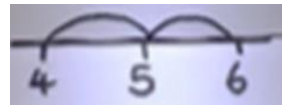


## Addition

*Methods of teaching addition in KS1*

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

**Teaching guidance:** When teaching addition refer to subtraction to ensure understanding of the inverse

Concrete	Pictorial	Abstract
<p>A1c Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p> 	<p>A1p Children to represent the cubes using dots and crosses. They could put each part on a part whole model too.</p> 	<p>A1a <math>4 + 3 = 7</math> Four is a part, 3 is a part and the whole is seven.</p> 
<p>A2c Counting on using number lines using cubes or Numicon.</p> 	<p>A2p A bar model which encourages the children to count on, rather than count all.</p> 	<p>A2a The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? <math>4 + 2</math></p> 

Drawing bar models can also be used as a valid written method. Again encouraging children to count on

**A3c**  
 Regrouping to make 10; using ten frames and counters/cubes or using Numicon.  
 $6 + 5$

**A3p**  
 Children to draw the ten frame and counters/cubes.

**A3a**  
 Children to develop an understanding of equality e.g.  
 $6 + \square = 11$   
 $6 + 5 = 5 + \square$   
 $6 + 5 = \square + 4$

**A4c**  
 TO + O using base 10. Continue to develop understanding of partitioning and place

value.  $41 + 8$

**A4p**  
 Children to represent the base 10 e.g. lines for tens and dot/crosses for ones.

**A4a**

$41 + 8$   
 $1 + 8 = 9$   
 $40 + 9 = 49$

## Addition

*Methods of teaching addition in KS2*

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

**Teaching guidance:** When teaching addition refer to subtraction to ensure understanding of the inverse

Concrete	Pictorial	Abstract
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A5c

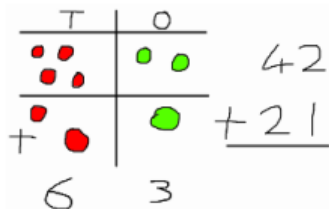
Column method - No regrouping

$$24 + 15 =$$

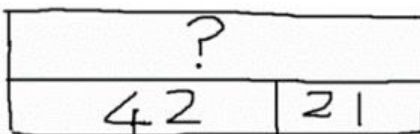
Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.

A5p

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



Alternatively bar models for addition can be very useful method to use.



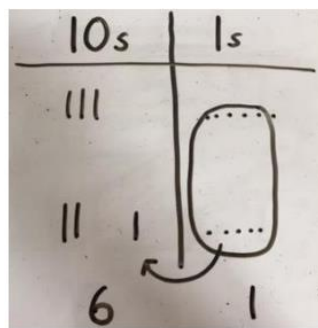
A5a

A6c

TO + TO using base 10. Continue to develop understanding of partitioning and place value.  $36 + 25$

A6p

Children to represent the base 10 in a place value chart.

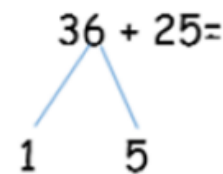


A6a

Looking for ways to make 10.

$$30 + 20 = 50$$

$$5 + 5 = 10$$



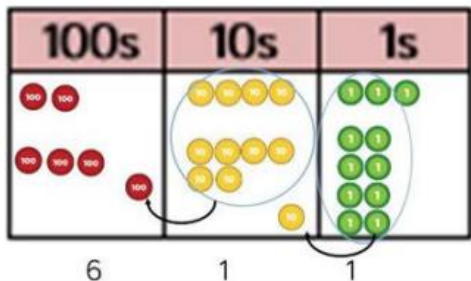
$$50 + 10 + 1 = 61$$

Formal method:

$$\begin{array}{r} 36 \\ +25 \\ \hline 61 \\ 1 \end{array}$$

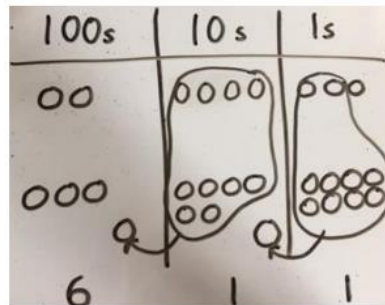
A7c

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column we exchange for 1 hundred.

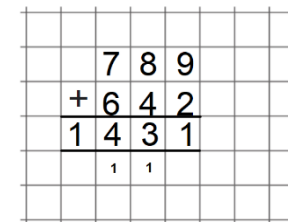


A7p

Children to represent the counters in a place value chart, circling when they make an exchange.



A7a



## Subtraction

*Methods of teaching addition in KS1*

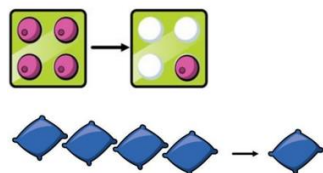
Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

Teaching guidance: When teaching subtraction refer to addition to ensure understanding of the inverse.

### Concrete

S1c

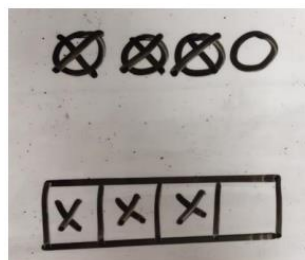
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).



### Pictorial

S1p

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

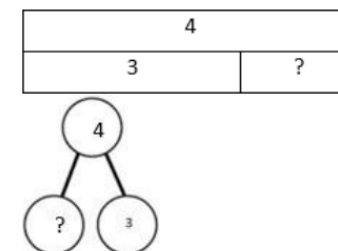


### Abstract

S1a

$$4 - 3 = ?$$

$$? = 4 - 3$$



S2c

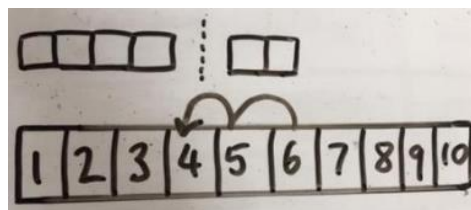
Counting back (using number lines or number tracks) children start with 6 and count back 2.

$$6 - 2 = 4$$



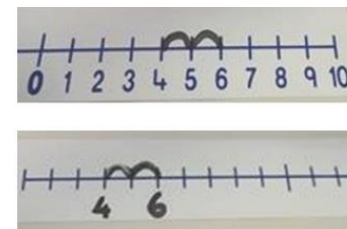
S2p

Children to represent what they see pictorially e.g.



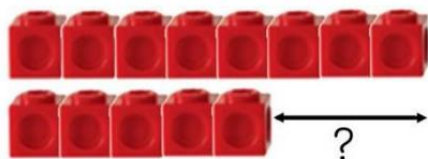
S2a

Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line.



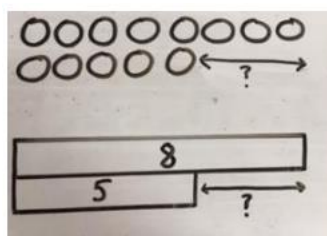
S3c

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5.



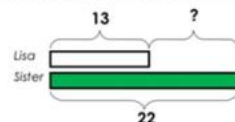
S3p

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



Comparison Bar Models

Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.



S3a

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.

S4c

Part, part whole model

S4p

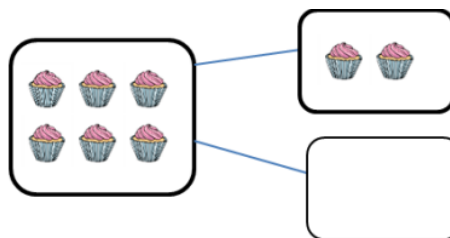
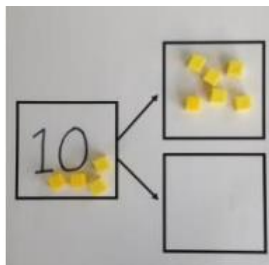
Use a pictorial representation of objects to show the part, part whole model.

S4a

Move to using numbers within the part whole model.

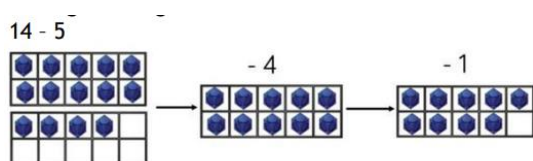
Link to addition- use the part whole model to help explain the inverse between addition and subtraction.

If 10 is the whole and 6 is one of the parts. What is the other part?  
 $10 - 6 =$

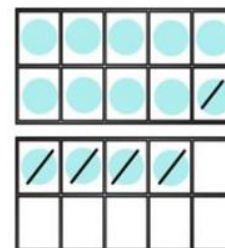


S5c  
 Making 10 using ten frames.

$14 - 5$

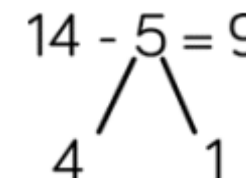


S5p  
 Children to present the ten frame pictorially and discuss what they did to make 10.



S5a  
 Children to show how they can make 10 by partitioning the subtrahend.

$14 - 4 = 10$   
 $10 - 1 = 9$



## Subtraction

*Methods of teaching addition in KS2*

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

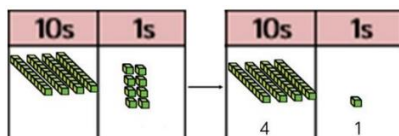
Teaching guidance: When teaching subtraction refer to addition to ensure understanding of the inverse.

### Concrete

### Pictorial

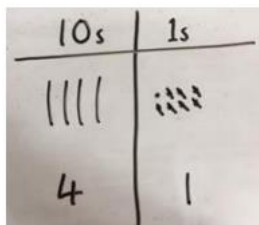
### Abstract

S6c  
 Column method using base 10.  
 $48 - 7$

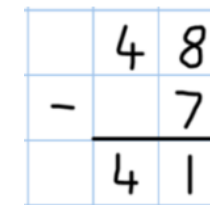


S6p  
 Children to represent the base 10 pictorially.

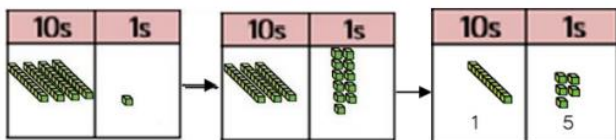
S6a  
 Column method or children could count



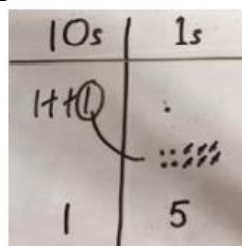
back 7.



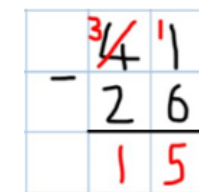
S7c  
Column method using base 10 and having to exchange. 41 - 26



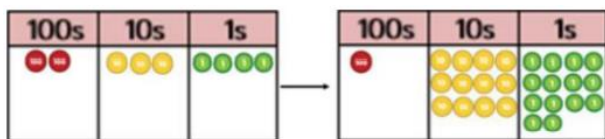
S7p  
Represent the base 10 pictorially, remembering to show the exchange.



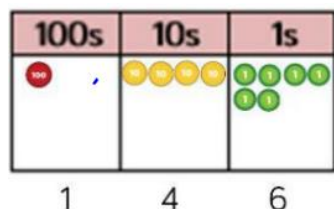
S7a  
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because  $41 = 30 + 11$ .



S8c  
Column method using place value counters. 234 - 88

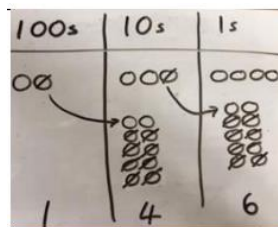


The exchange from H to T and T to O are shown with counters and then the 88 is subtracted.

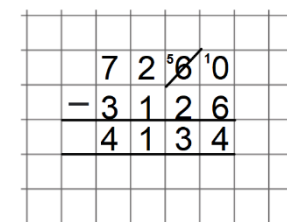


S8p  
Represent the place value counters pictorially; remembering to show what has been exchanged.

The exchange is represented then the 88 is taken.



S8a  
Formal column method. Children must understand what has happened when they have crossed out digits.

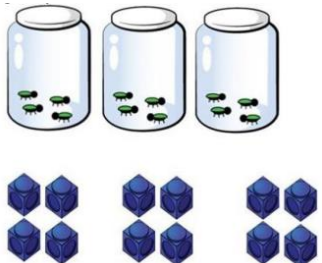
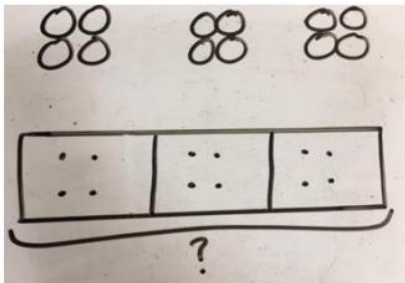

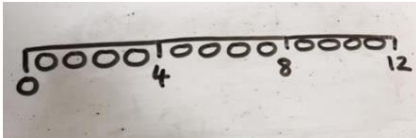
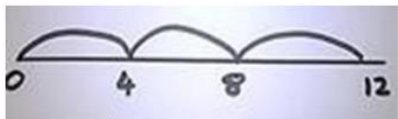


# Multiplication

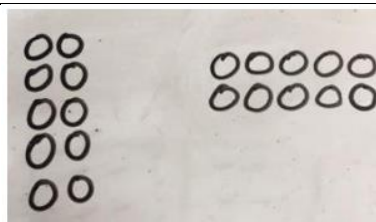
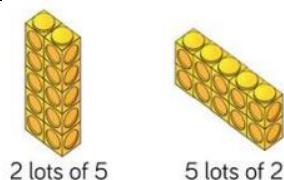
*Methods of teaching Multiplication in KS1*

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

**Teaching guidance:** When teaching multiplication refer to division to ensure understanding of the inverse.

Concrete	Pictorial	Abstract
<p>M1c Repeated grouping/repeated addition <math>3 \times 4</math> <math>4 + 4 + 4</math> There are 3 equal groups, with 4 in each group.</p> 	<p>M1p Children to represent the practical resources in a picture and use a bar model.</p> 	<p>M1a</p> <p><math>3 \times 4 = 12</math> <math>4 + 4 + 4 = 12</math></p> <p>Link repeated addition to division. (Do and undo method.) Demonstrating the inverse. <math>4 + 4 + 4 = 12</math> <math>12 - 4 - 4 = 4</math> <math>12 \div 3 = 4</math> See repeated subtraction in Division guide below.</p>
<p>M2c Number lines to show repeated groups- <math>3 \times 4</math></p>  <p>Cuisenaire rods can be used too.</p>	<p>M2p Represent this pictorially alongside a number line e.g.:</p> 	<p>M2a Abstract number line showing three jumps of four.</p> <p><math>3 \times 4 = 12</math></p> 
<p>M3c Use arrays to illustrate commutativity counters and other objects can also be used. <math>2 \times 5 = 5 \times 2</math></p>	<p>M3p Children to represent the arrays pictorially.</p>	<p>M3a Children to be able to use an array to write a range of calculations e.g. <math>10 = 2 \times 5</math></p>





$$5 \times 2 = 10$$

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

$$10 = 5 + 5$$

Use arrays to teach inverse of multiplication and division.  
 $10 \div 2 = 5$   
 $10 \div 5 = 2$

## Multiplication

*Methods of teaching Multiplication in KS2*

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

**Teaching guidance:** When teaching multiplication refer to division to ensure understanding of the inverse.

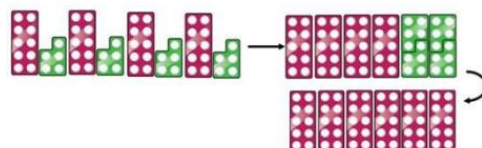
### Concrete

### Pictorial

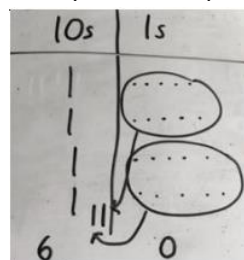
### Abstract

**M4c**  
 Partition to multiply using Numicon, base 10 or Cuisenaire rods.

$$4 \times 15$$



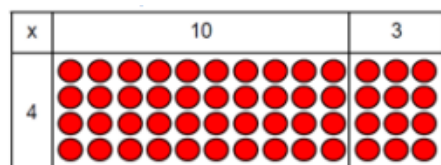
**M4p**  
 Children to represent the concrete manipulatives pictorially.



**M4a**  
 Children to be encouraged to show the steps they have taken.

$$\begin{array}{r}
 4 \times 15 \\
 \hline
 10 \quad 5 \\
 10 \times 4 = 40 \\
 5 \times 4 = 20 \\
 40 + 20 = 60
 \end{array}$$

**M5c**  
**GRID METHOD**  
 Show the link with arrays to first introduce the grid method.

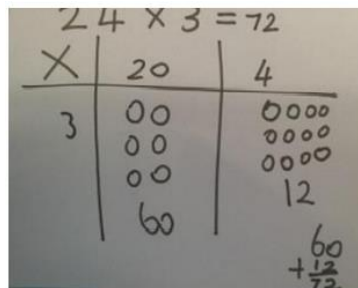
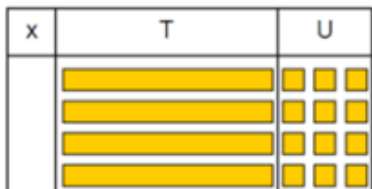


**M5p**  
 Children can represent the work they have done. They can draw the counters, using colours to show different columns to show their working.

**M5a**  
 Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

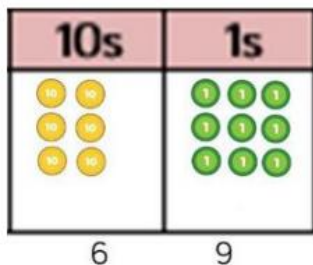
$$\begin{array}{r|l|l}
 \times & 20 & 4 \\
 \hline
 6 & 120 & 24 \\
 \hline
 & 120 + 24 = 144 & 
 \end{array}
 \qquad
 \begin{array}{r|l|l|l}
 \times & 300 & 40 & 2 \\
 \hline
 7 & 2100 & 280 & 14 \\
 \hline
 & 2100 + 280 + 14 = 2394 & & 
 \end{array}$$

4 rows of 10  
 4 rows of 3  
 Move on to using Base 10 to move towards a more compact method.

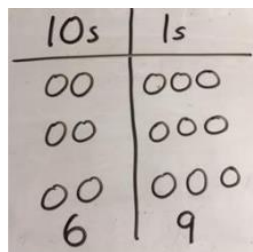


Moving forward, multiply by a 2 digit number showing the different rows within the grid method

M6c  
 Formal column method with place value counters (base 10 can also be used.)  $3 \times 23$

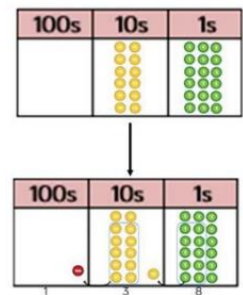


M6p  
 Children to represent the counters pictorially.

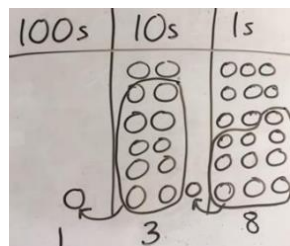


M6a  
 Children to record what it is they are doing to show understanding.  
 $3 \times 23$   $3 \times 20 = 60$   
 $3 \times 3 = 9$   
 $20 \ 3 \ 60 + 9 = 69$

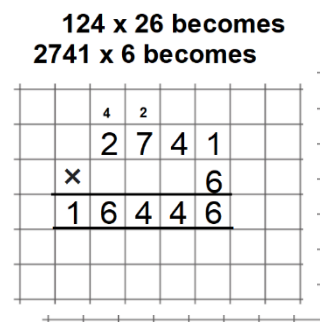
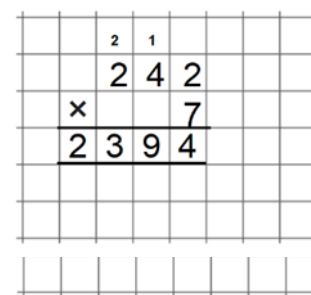
M7c  
 Formal column method with place value counters.  $6 \times 23$



M7p  
 Children to represent the counters/base 10, pictorially e.g. the image below.



M7a  
 Formal written method

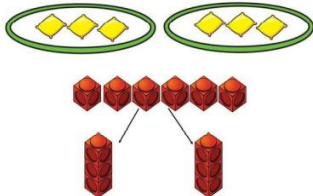
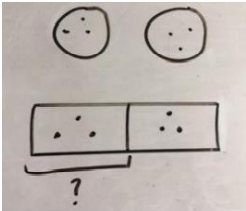

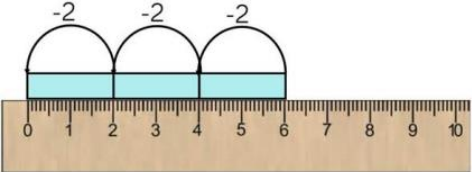
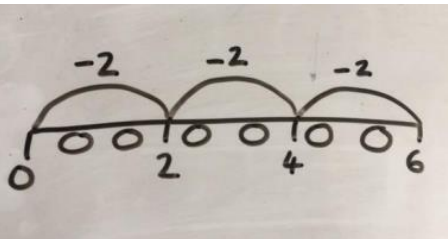
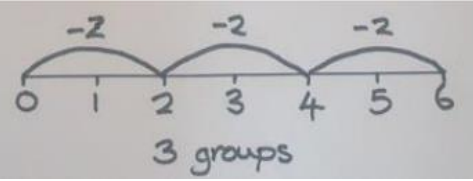


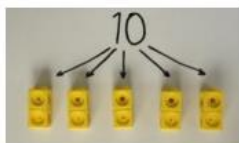
# Division

*Methods of teaching Division in KS1*

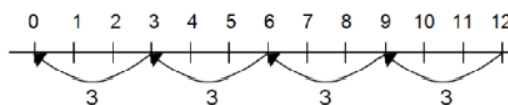
Key language: share, group, divide, divided by, half.

**Teaching guidance:** When teaching division refer to multiplication to ensure understanding of the inverse.

Concrete	Pictorial	Abstract
<p>D1c Sharing using a range of objects. <math>6 \div 2</math></p> 	<p>D1p Represent the sharing pictorially through bar modelling.</p> 	<p>D1a <math>6 \div 2 = 3</math></p>  <p>Children should also be encouraged to use their 2 times tables facts.</p>
<p>D2c Repeated subtraction using Cuisenaire rods above a ruler. <math>6 \div 2</math></p>  <p>3 groups of 2</p>	<p>D2p Children to represent repeated subtraction pictorially.</p> 	<p>D2a Abstract number line to represent the equal groups that have been subtracted.</p> 
<p>D3c Division as grouping. Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>	<p>D3p Number of jumps equals the number of</p>	<p>D3a <math>28 \div 7 = 4</math> Divide 28 into 7 groups. How many are in each group?</p>



groups.



Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.



$$20 \div 5 = ?$$

$$5 \times ? = 20$$

D4c

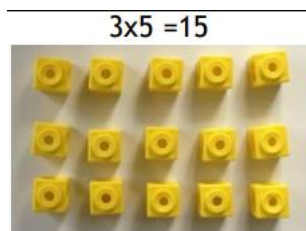
Division with arrays.

Link division to multiplication by creating an array and thinking about the number sentences that can be created.

$$15 \div 3 = 5$$

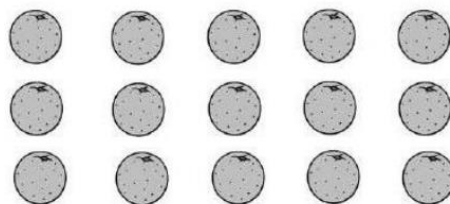
$$15 \div 5 = 3$$

$$5 \times 3 = 15$$



D4p

Draw an array and use lines to split the array into group to make multiplication and division sentences.



D4a

Find the inverse of multiplication and division sentences by creating four linking number sentences.

$$7 \times 3 = 21$$

$$4 \times 7 = 28$$

$$28 \div 7 = 4$$

$$28 \div 4 = 7$$

## Division

*Methods of teaching Division in KS2*

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

Teaching guidance: When teaching division refer to multiplication to ensure understanding of the inverse.

D5c

$2d \div 1d$  with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used.

$13 \div 4$

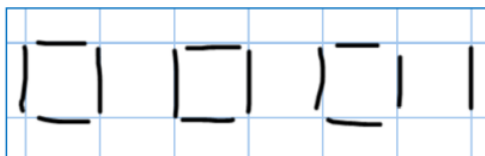
Use of lollipop sticks to form wholes-squares are made because we are dividing by 4.



There are 3 whole squares, with 1 left over.

D5p

Children to represent the lollipop sticks pictorially.

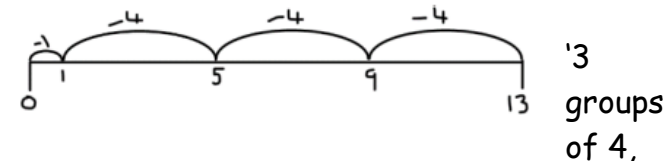


There are 3 whole squares, with 1 left over.

D5a

$13 \div 4 = 3$  remainder 1

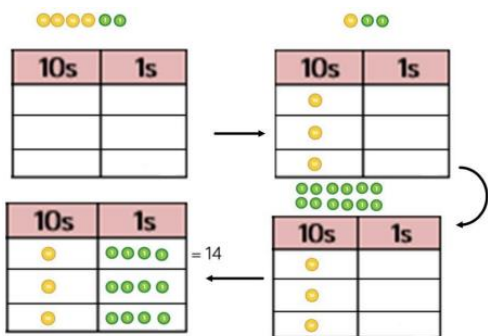
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.



with 1 left over'

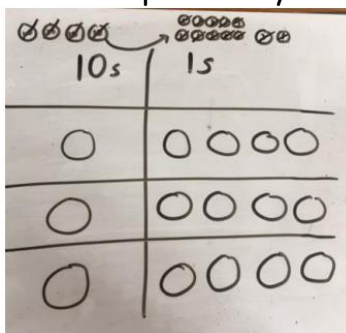
D6c

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



D6p

Children to represent the place value counters pictorially.



D6a

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

$42 \div 3$   
 $42 = 30 + 12$   
 $30 \div 3 = 10$   
 $12 \div 3 = 4$   
 $10 + 4 = 14$

D7c

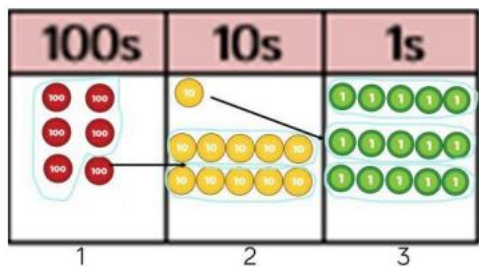
Short division using place value counters to group.  $615 \div 5$

D7p

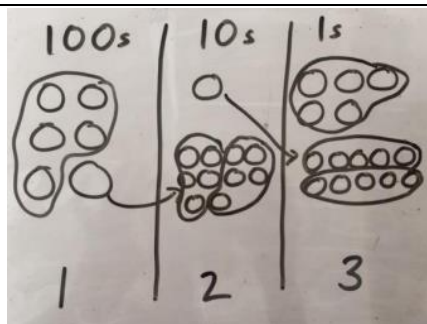
Represent the place value counters pictorially.

D7a

Children to the calculation using the short division scaffold.



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



		1	4	r	1
3	4	3			

			3	2	1
					$\frac{3}{13}$
1	3	4	1	7	6