

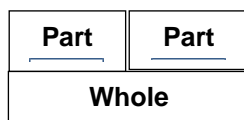
This document provides an overview of the methods taught in addition, subtraction, multiplication and division throughout the school. These methods are in line with the new National Curriculum that has been introduced from September 2014. Children may be at different stages in their progression through the different methods. An example of each method is shown below. Some of the examples show the apparatus that we may use in school to support (e.g. bead strings, counters) if you are practising at home, these can be substituted for everyday items (e.g. pencils, buttons) or can be drawn on paper. In years 3 and 4 the focus is on informal methods and different representations, then in year 5 and 6 the children will move onto more formal written methods.

Please ask your child or their class teacher which method they are currently working on and follow this at home. If you have any further questions please see your child's teacher.

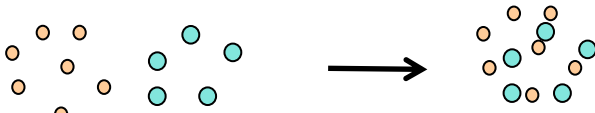
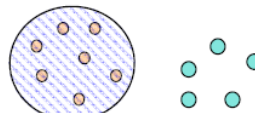
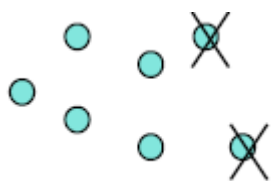

Sarah Drake
Maths Leader

Progression in addition and subtraction

Addition and subtraction are connected.

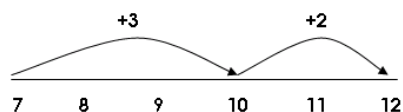


Addition names the whole in terms of the parts and **subtraction** names a missing part of the whole.

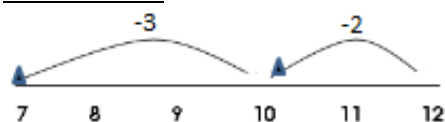
<u>Addition</u>	<u>Subtraction</u>
<p><u>Combining two sets</u> Putting together – two or more amounts or numbers are put together to make a total $7 + 5 = 12$</p>  <p>Count one set, then the other set. Combine the sets and count again. Starting at 1.</p> <p><u>Combining two sets</u> Where one quantity is increased by some amount. Count on from the total of the first set, e.g. put 3 in your head and count on 2. Always start with the largest number.</p>  <p><u>Counters:</u></p> <p>Start with 7, then count on 8, 9, 10, 11, 12</p>	<p><u>Taking away</u> Where one amount is taken away from another to calculate what is left. $7 - 2 = 5$</p>  <p><u>Finding the difference</u> Two quantities are compared to find the difference. $8 - 2 = 6$ <u>Counters:</u></p> 

Bridging through 10s.

Number line



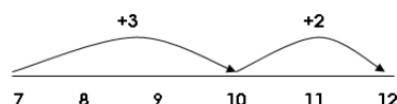
Number Line:



Finding the difference between

$12 - 7 =$ Find the difference between 12 and 7

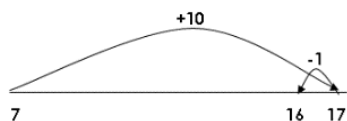
Number Line:



Adding and subtracting numbers near to 10

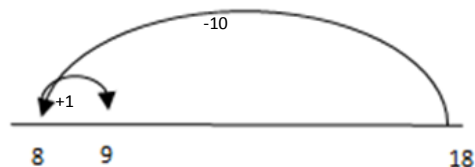
$7 + 9$

Number line:



$18 - 9$

Number line:



Working with larger numbers Tens and units + tens and units

Partitioning

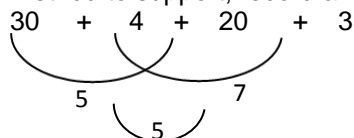
$34 + 23 = 57$
 $30 + 4 + 20 + 3 =$

Number line:



At this stage, children can begin to use an informal method to support, record and explain their method.

$30 + 4 + 20 + 3 =$

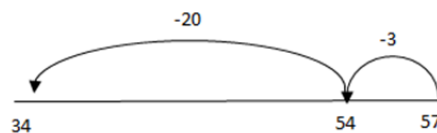


Take away

$57 - 23 = 34$
 $57 - 3 = 54$
 $54 - 20 = 34$

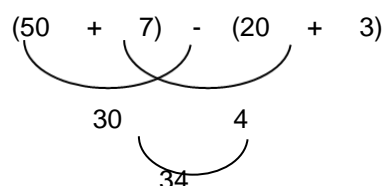
Children remove the lower quantity from the larger set, starting with the units and then the tens

Number Line:



At this stage, children can begin to use an informal method to support, record and explain their method

$(50 + 7) - (20 + 3) =$



Adding and subtracting using a formal written method

The visual images show how this could be represented.

Compact method

Tens	Ones
	■ ■ ■
	■ ■ ■
	■ ■ ■
	■ ■ ■

→

$$\begin{array}{r} 25 \\ 47 \\ \hline 72 \\ 1 \end{array}$$

Leading to

Tens	Ones
	■ ■ ■
	■ ■ ■
	■ ■ ■
	■ ■ ■

→

$$\begin{array}{r} 25 \\ 47 \\ \hline 72 \\ 1 \end{array}$$

Hundreds	Tens	Units
■ ■		■ ■ ■
		■ ■ ■
		■ ■ ■
		■ ■ ■

→

$$\begin{array}{r} 367 \\ + 85 \\ \hline 452 \\ 11 \end{array}$$

Leading to

Compact method

Tens	Ones
	■ ■
	■ ■
	■ ■
	■ ■

→

$$\begin{array}{r} 72 \\ -25 \\ \hline 47 \end{array}$$

Tens	Ones
	■ ■
	■ ■
	■ ■
	■ ■

→

$$\begin{array}{r} 72 \\ -25 \\ \hline 47 \end{array}$$

Tens	Ones
	■ ■
	■ ■
	■ ■
	■ ■

→

$$\begin{array}{r} 72 \\ -25 \\ \hline 47 \end{array}$$

Decimals

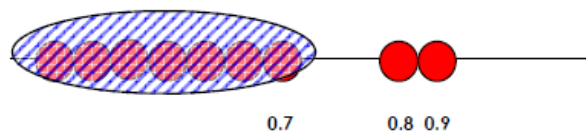
Addition of decimals

Counting both sets – starting at zero.

$$0.7 + 0.2 = 0.9$$



Starting from the first set total, count on to the end of the second set. $0.7 + 0.2 = 0.9$



Partitioning

$$3.7 + 1.5 = 5.2$$

$$3 + 0.7 + 1 + 0.5 =$$

Subtraction of decimals

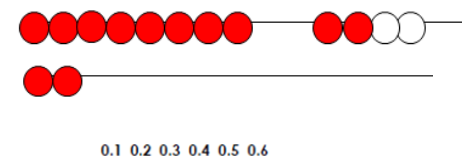
Take away model

$$0.9 - 0.2 = 0.7$$



Finding the difference (or comparison):

$$0.8 - 0.2 =$$



Partitioning

$$5.7 - 2.3 = 3.4$$

$$5 + 0.7 + 2 + 0.3 =$$

Multiplication and division are connected.
 Both express the relationship between a number of equal parts and the whole.

Part	Part	Part	Part
Whole			

The following array (a diagram showing columns and rows) consisting of four columns and three rows, could be used to represent the number sentences: -



$$3 \times 4 = 12,$$

$$4 \times 3 = 12,$$

$$3 + 3 + 3 + 3 = 12,$$

$$4 + 4 + 4 = 12.$$

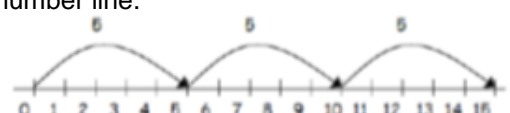


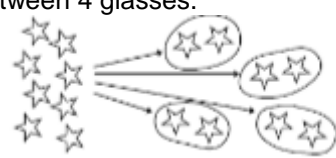

And it is also a model for division

$$12 \div 4 = 3$$

$$12 \div 3 = 4$$

$$12 - 4 - 4 - 4 = 0$$

$$12 - 3 - 3 - 3 - 3 = 0$$

Multiplication	Division
<p><u>Repeated addition</u> 3 times 5 is $5 + 5 + 5 = 15$ or 5 lots of 3 or 5×3 Children learn that repeated addition can be shown on a number line.</p>  <p>Children learn that repeated addition can be shown on a bead string.</p>  <p>Children also learn to partition totals into equal parts</p> 	<p><u>Sharing equally</u> 6 sweets get shared between 2 people. How many sweets do they each get? A bottle of fizzy drink shared equally between 4 glasses.</p>  <p><u>Grouping or repeated subtraction</u> There are 6 sweets. How many people can have 2 sweets each?</p> 

Scaling

Example, where you have 3 giant marbles and you swap each one for 5 of your friend's small marbles, you will end up with 15 marbles.

This can be written as:

$$1 + 1 + 1 = 3 \quad \square \text{ scaled up by } 5 \quad \square 5 + 5 + 5 = 15$$

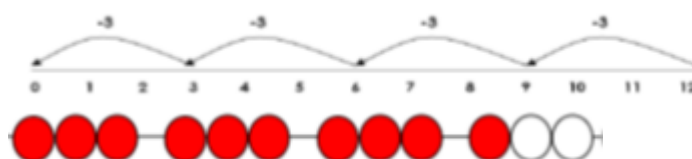


For example, find a ribbon that is 4 times as long as the blue ribbon.



Repeated subtraction using a bead string or number line

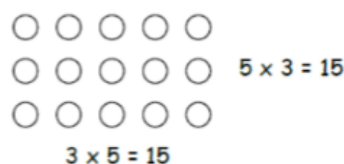
$$12 \div 3 = 4$$



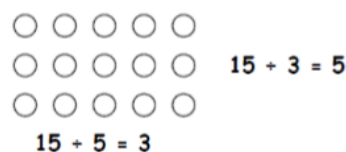
The bead string helps children with interpreting division calculations, recognising that $12 \div 3$ can be seen as 'how many 3s make 12?'

Arrays

Children learn to model a multiplication calculation using an array. This supports the understanding that multiplication can be done in any order.

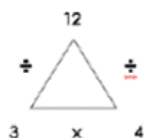


Children learn to model a division calculation using an array.



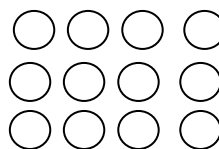
Inverse operations

Trios can be used to model the 4 related multiplication and division facts. Children learn to state the 4 related facts.



$$\begin{aligned} 3 \times 4 &= 12 \\ 4 \times 3 &= 12 \\ 12 \div 3 &= 4 \\ 12 \div 4 &= 3 \end{aligned}$$

This can also be supported using arrays: e.g. $3 \times ? = 12$



Children use symbols to represent unknown numbers and complete equations using inverse operations. They use this strategy to calculate the missing numbers in calculations.

$$\begin{aligned} \square \times 5 &= 20 & 3 \times \Delta &= 18 & \bigcirc \times \square &= 32 \\ 24 \div 2 &= \square & 15 \div \bigcirc &= 3 & \Delta \div 10 &= 8 \end{aligned}$$

Grid method

This written strategy is introduced for the multiplication of tens and units x units to begin with. It may require column addition methods to calculate the total.e.g. 35×4

	30	5
4	120 (30 x 4)	20 (4x5)

$$\begin{array}{r} 120 \\ + 20 \\ \hline 140 \end{array}$$

The vertical method- 'chunking'

This method involves taking chunks off the total to divide $78 \div 3 =$

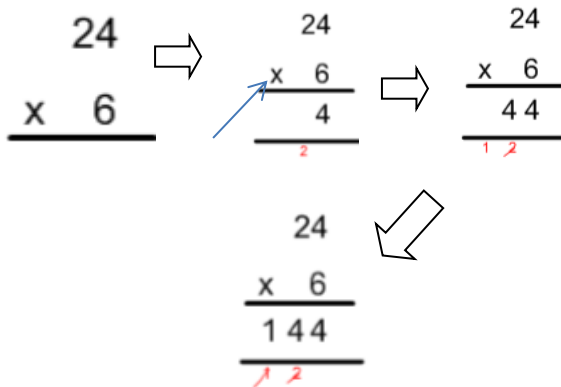
$$\begin{array}{r} 78 \\ - 30 \\ \hline 48 \\ - 30 \\ \hline 18 \\ - 18 \\ \hline 0 \end{array} \quad \begin{aligned} &(10 \times 3) \\ &(10 \times 3) \\ &(6 \times 3) \end{aligned}$$

$$\text{So } 78 \div 3 = 10 + 10 + 6 = 26$$

Multiplying and dividing using a formal written method

Short multiplication — multiplying by a single digit

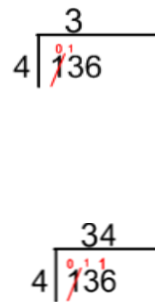
24×6



$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \end{array}$$

Short division — dividing by a single digit

$136 \div 4$



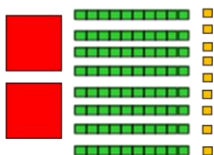
$$\begin{array}{r} 34 \\ 4 \overline{) 136} \\ \underline{12} \\ 16 \\ \underline{16} \\ 0 \end{array}$$

Dividing by numbers between 11 and 19

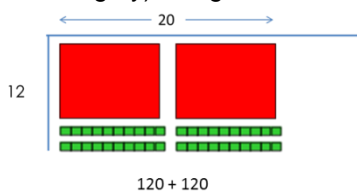
Visual representation

Children may benefit from practise to make multiples of tens using the hundreds and tens and tens and units.

$289 \div 12$

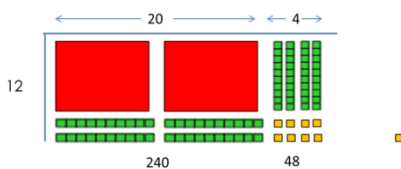


1. Make a rectangle where one side is 12 (the number dividing by) using hundreds and tens



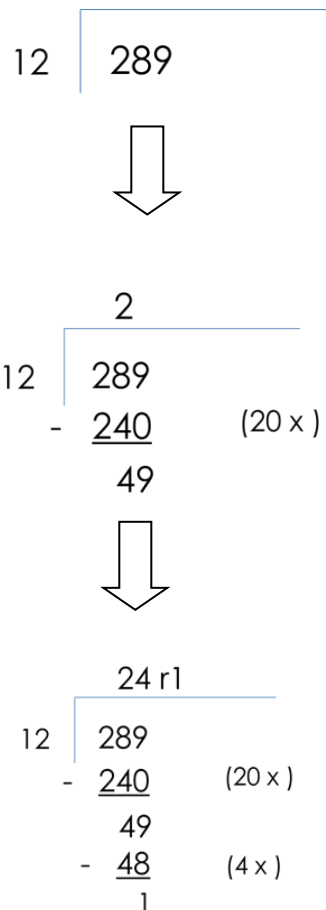
With 49 remaining

2. Make groups of 12 using tens and units



No more groups of 12 can be made and 1 remains

Formal method



$$\begin{array}{r} 24 \text{ r}1 \\ 12 \overline{) 289} \\ \underline{240} \\ 49 \\ \underline{48} \\ 1 \end{array}$$