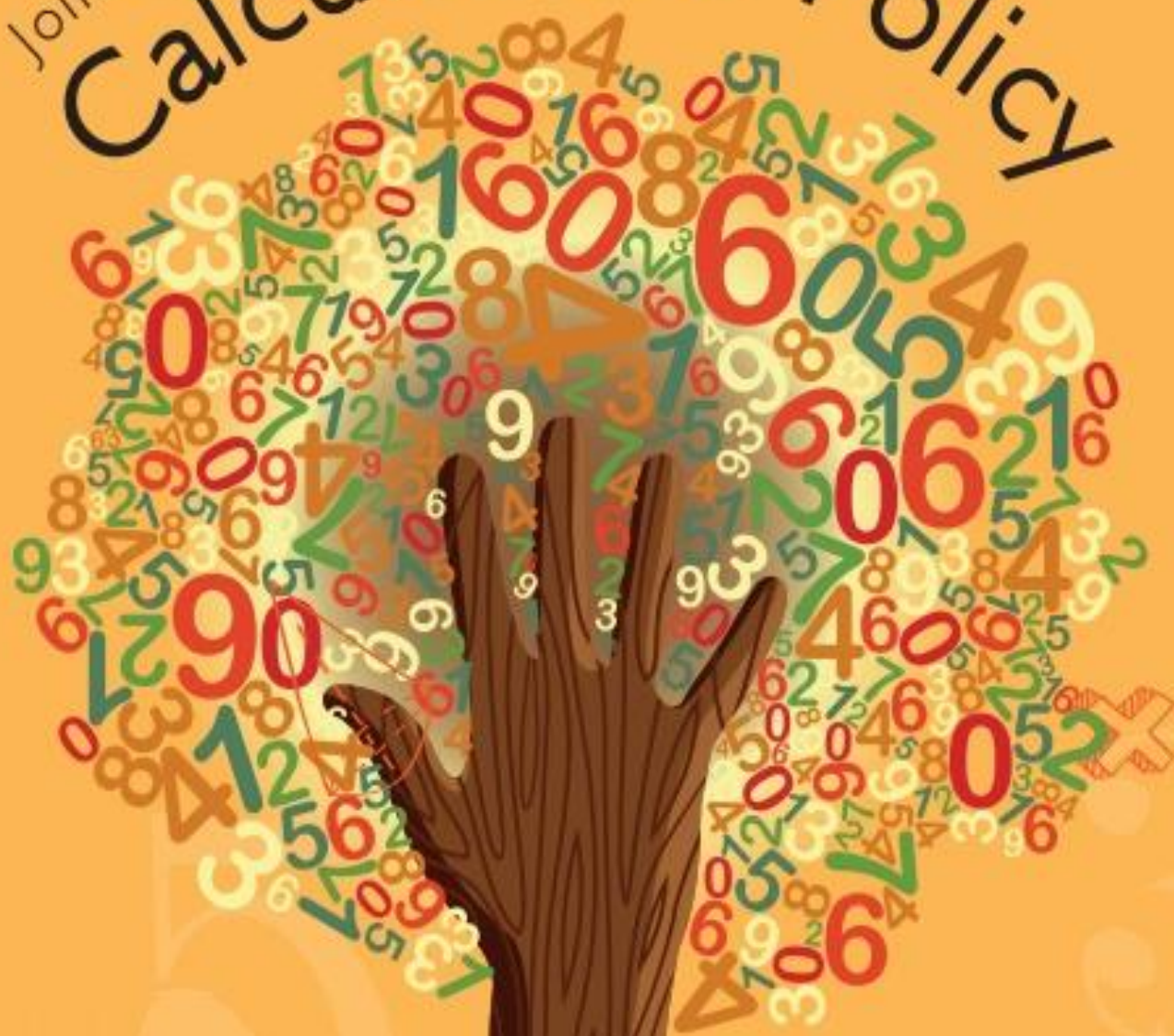


Joint Pyramid Maths

Calculations Policy



INTRODUCTION

The following calculations policy has been written by the Mathematics Lead Teachers from Bere Regis Primary School, Lytchett Matravers Primary School, Lytchett Minster School, Sandford Primary School, Upton Infant School and Upton Junior School.

It has been written in line with the programmes of study taken from the National Curriculum for Mathematics (2014). Our schools have worked in close partnership to ensure continuity of written methods across all Pyramid Schools, getting the very best for all of our children.



Upton Junior School



Bere Regis Primary School



Sandford St Martin's Primary School

This policy provides guidance on the calculation strategies, methods and progression from the Early Years Foundation Stage (Reception) to Key Stage 4 (secondary education). It aims to help parents to help their children, as well as provide guidelines for teachers to provide consistency in the teaching of mathematics across our schools. Although not exhaustive, it outlines the key strategies taught across our schools.

AIMS OF THE POLICY

Through the Mathematics National Curriculum, our schools aim to work together to ensure that all pupils:

1. **become fluent in the fundamentals of mathematics**, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
2. **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.
3. **can solve problems by applying their mathematics** to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

This policy will ensure consistency and progression in our approach to the learning and teaching of calculations across our pyramid schools. It will enable our children, teachers and parents to work in partnership, developing an efficient, reliable, formal written method of calculation for all operations and to use these methods accurately with confidence for understanding.



Lytchett Matravers Primary School



Upton Infant School



Lytchett Minster School

HOW TO USE THIS POLICY

It is vital that we create a generation of children who understand the mathematics that they are learning. Not only can they perform a 'set skill', but they can explain and understand exactly what they are doing with each number and more importantly, why.



As you explore this policy, you will find the following prompts to help you. The content is set out with each section beginning with the vocabulary that children will come across for each operation (+ - x ÷). Below is a key to explain why each of these is so important to our children's education.



Age Related Expectations

When you see this symbol, you will also find the government's 'Age Related Expectations' (ARE) as set out in the national curriculum 2014. These expectations are what we would expect a child of this age to achieve in terms of mathematics within that Key Stage or Year Group, by the end of their time within this stage. A full breakdown of these ARE for each year group can be found within the programmes of study online, at tinyurl.com/NatCur2014.



Top Tips!

These are designed to remind you of different aspects to consider when teaching our children. For example, to use a wide range of manipulatives (mathematical equipment and resources) when teaching mathematics, as this reinforces what is actually happening to numbers and provides a concrete approach before moving on to more pictorial (pictures) and abstract (signs and symbols) approaches. Children will record calculations in a variety of ways that do not necessarily look like the kind of 'sums' parents remember. This is because written calculations are not the ultimate aim: the children's understanding and fluency within mathematics is.



Developing Mental Methods

This outlines mental calculation strategies, including the use of jottings, vocabulary to be developed and the key number facts that children will need to know mentally in order to become fluent in the fundamentals of mathematics. Children will use mental methods as their first port of call when appropriate, but for calculations that they cannot do in their heads, they will need to use an efficient written method accurately and with confidence. The strategies taught aim to help children understand *what* they are doing and *why* they are doing it, and the relationships between numbers which can then be applied to develop speed with mental calculations.



Scan to watch video



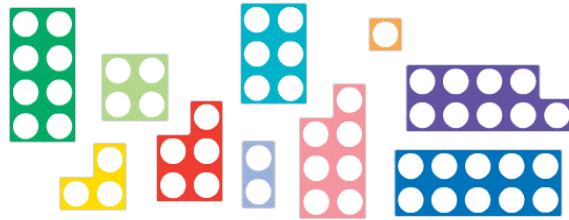
Take a look at videos created by the teachers and children of our schools, explaining how to use different operations in this policy. You can scan them with your smart phone or access them on our school websites.

If you find something that you would like to see explained a little further, or in more depth, please contact the Mathematics Lead Teacher from your school.

Equipment

We use a variety of equipment to support children's learning in mathematics. These 'manipulatives' play a useful role in the teaching of maths, particularly in the teaching of concepts. Here is a description of some of the equipment the children use frequently:

Numicon



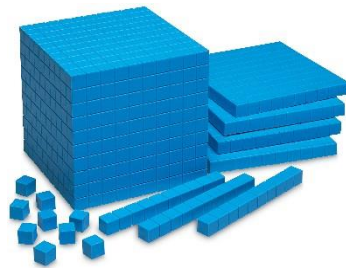
Numicon apparatus is multi-sensory equipment. The Numicon patterns are arrangements of holes in plastic shapes that correspond to the numbers 1 to 10.

Counting Straws



Counting straws are arranged singularly and in bundles of ten to help children to visualise the value of the digits in 2-digit numbers.

Dienes' Apparatus (Base Ten)



Dienes' Apparatus (or Base Ten cubes) are organised into ones cubes, tens rods, hundreds sheets and thousands cubes. They are used to visualise numbers up to 4 digits.

Bead Strings



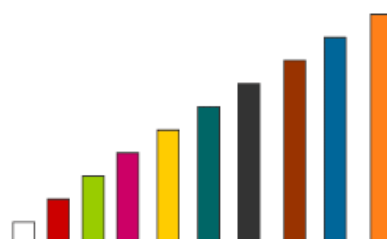
Bead strings are moveable beads, typically arranged in groups of 10, similarly to an abacus.

Unifix Cubes



Unifix cubes can be grouped together to make numbers in different arrangements, for example in groups of 2's, 5's or 10's.

Cuisenaire Rods



Cuisenaire rods can be used to represent numbers. Each piece can be attributed a number, which is also equal to its weight and length (for example a red piece can be attributed the value of 2, is 2cm long and weighs 2g).

Addition +



add
and
plus
sum

more than
addition
count on
total
increase

join
bigger
together
more



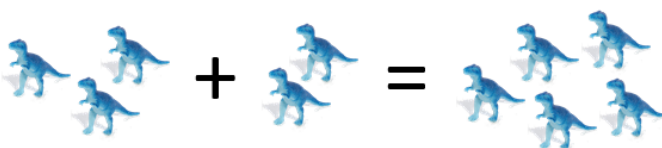
Foundation Stage



Age Related
Expectations

- Use the language of 'more' and 'fewer' to compare two sets of objects
- Find the total number of items in two groups by counting all of them
- Say the number that is one more than a given number
- Finds one more from a group of up to five objects, then ten objects
- In practical activities and discussion, beginning to use the vocabulary involved in adding

Begin to
relate
addition to
combining
sets of items
together



Find one more
than a
number

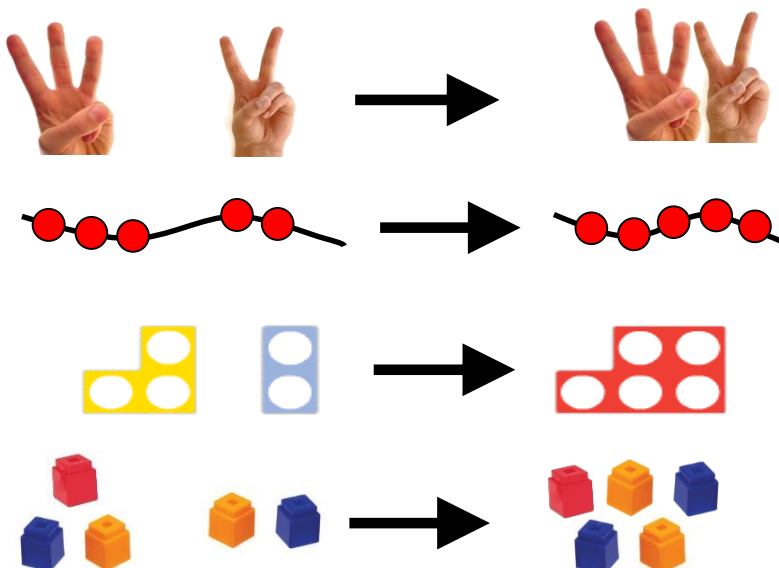


Use a range of
different
equipment to
develop children's
understanding

Top Tip!



Adding using
fingers and
other practical
resources

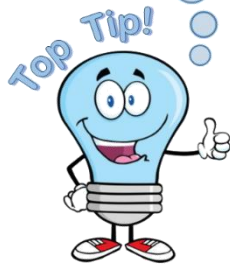
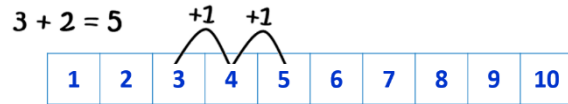


Introduction
of symbols to
form number
sentences

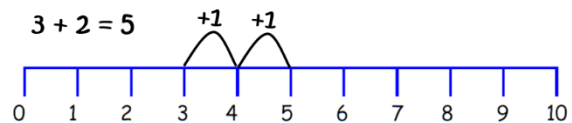
$$3 + 2 = 5$$

Number tracks are an essential starting point for children's understanding of number, aiding 1:1 correspondence between numbers and squares

Develop
understanding
of addition as
counting steps
along a
number track



Develop
understanding
of addition as
counting steps
along a
number line



Key Stage One



Age Related
Expectations

- solve missing number problems such as $7 = \square - 9$
- solve addition problems using objects and pictorial representations
- apply their increasing knowledge of mental and written methods
- recall and use number bonds, addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- add one and two-digit numbers using objects, pictorially and mentally
- add three one-digit numbers
- show that addition can be done in any order (commutative)



Developing
mental
methods

Mental addition and fluency is developed through frequent practise of strategies taught, including addition facts to 20 and related facts to 100, and addition of 1 and 2-digit numbers (including three 1-digit numbers).

Developing
knowledge
and
understanding
of number
bonds to 10

e.g.



$$7 + 3 = 10$$

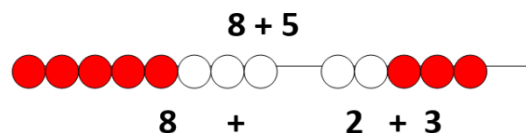


$$6 + 4 = 10$$

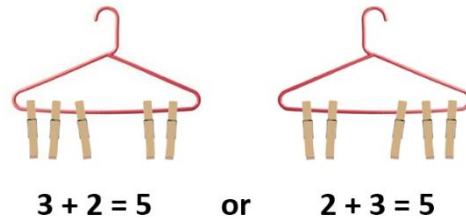


$$9 + 1 = 10$$

Using bead
strings to
count on by
bridging
through 10



Understand that addition is commutative (can be done in any order)



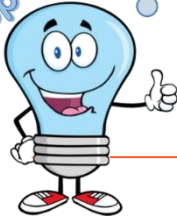
Vary position of missing numbers in a number sentence

$$2 + \square = 5$$

$$\square + 4 = 7$$

A hundred square is simply an extension of a number track – cut it up into strips to illustrate this!

Top Tip!

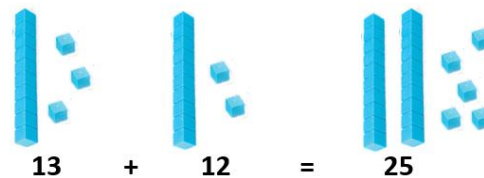


Counting on in jumps of one using a hundred square

$$22 + 6$$

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Dienes' Apparatus

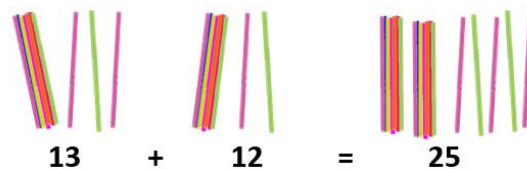


Scan to watch video

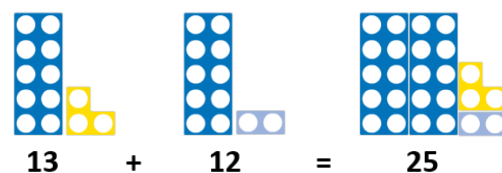


Addition of 2-digit numbers using practical resources

Counting Straws



Numicon



$$32 + 26$$

Counting on in jumps of ten and one using a hundred square

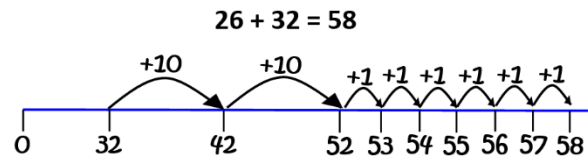
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Vary position of missing numbers in a number sentence

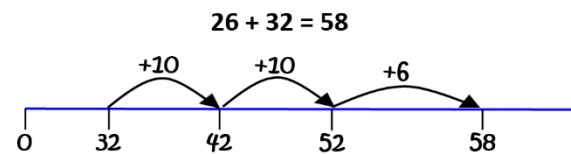
$$21 + \square = 43$$

$$\square + 32 = 58$$

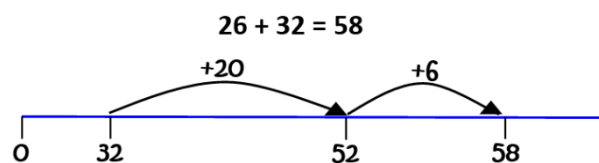
Addition using a blank number line (putting biggest number first)



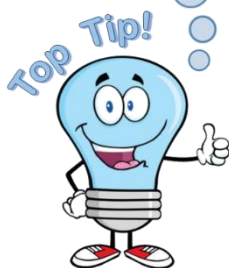
Using a blank number line, add the ones in one jump (using the known fact $6 + 2 = 8$)



Using a blank number line, adding the tens in one jump and the ones in one jump



Children will encounter the terms 'ones' and 'units' which can be used interchangeably. Use of the term 'ones' helps children to understand the value of the digit



Adding by partitioning, keeping the first number whole

$$26 + 32$$

$$26 + 30 + 2$$

$$26 + 30 = 56 \text{ (add the tens)}$$

$$56 + 2 = 58 \text{ (add the ones)}$$

Adding by partitioning into tens and ones

$$26 + 32 = 20 + 30 + 6 + 2 = 58$$

Adding by
partitioning
into tens and
ones

$$\begin{array}{r} \text{T O} \quad \text{T O} \\ 26 + 32 \\ \hline 50 + 8 = 58 \end{array}$$

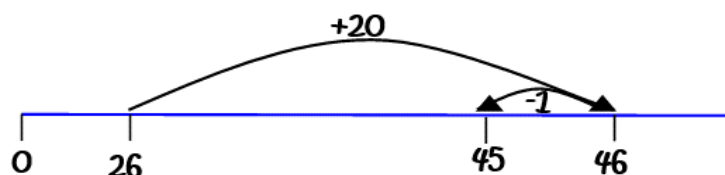
e.g. adding 9 / 19 / 29 or 8 / 28 / 38

$$26 + 19 = 45$$

Adding by
compensation

$$26 + 20 = 46$$

$$46 - 1 = 45$$



Key Stage Two



Age Related
Expectations

- Estimate the answer to a calculation and use the inverse operation to check answers.
- Solve problems involving addition, including missing number problems, using number facts, place value, and more complex addition
- Add numbers with more than 4 digits using column addition
- Add increasingly large numbers mentally
- Solve multi-step addition problems, deciding which operation and method to use and why



Developing
mental
methods

Children should have regular practise of mental addition, including multiple numbers. Explore how children visualise numbers in their heads, and encourage them to use a variety of methods for manipulating numbers. They should be able to add 3 1-digit numbers mentally and any pair of 2-digit numbers mentally, using a strategy of their choice.

$$45 + 17$$

Begin to use
expanded
written
methods

$$\begin{array}{r} \text{T} \quad \text{U} \\ 40 \quad 5 \\ + 10 \quad 7 \\ \hline 50 + 12 \quad 62 \end{array}$$

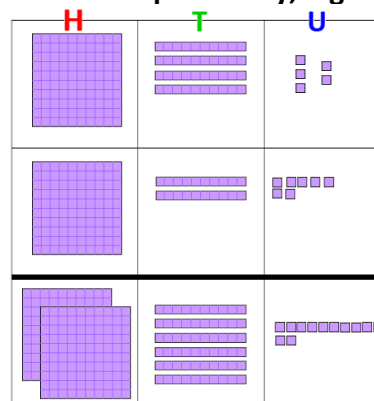
Introduce practically, e.g.

	T	U

Progress to
expanded
written
methods
involving
hundreds

$$\begin{array}{r}
 145 + 127 \\
 \begin{array}{ccc} \text{H} & \text{T} & \text{U} \\ 100 & 40 & 5 \\ + 100 & 20 & 7 \end{array} \\
 \hline
 200 + 60 + 12 \quad 272
 \end{array}$$

Introduce practically, e.g.



Reinforce
understanding
with use of
arrow cards



Continue to use
practical apparatus to
deepen understanding,
exchanging ones for
tens and tens for
hundreds when
necessary

Top Tip!



Addition using
the compact
written
method
involving
carrying,
adding the
ones first

$$264 + 148$$

$$\begin{array}{r}
 \begin{array}{ccc} \text{H} & \text{T} & \text{U} \\ 2 & 6 & 4 \\ + 1 & 4 & 8 \end{array} \\
 \hline
 4 & 1 & 2 \\
 1 & 1 &
 \end{array}$$

Addition using
the compact
written
method
progressing to
thousands

$$3364 + 247$$

$$\begin{array}{r}
 \begin{array}{ccc} \text{H} & \text{T} & \text{U} \\ 3 & 3 & 6 & 4 \\ + & 2 & 4 & 7 \end{array} \\
 \hline
 3 & 6 & 1 & 1 \\
 1 & 1 & &
 \end{array}$$

Addition
involving
decimals
using compact
written
methods

$$3.56 + 2.47$$

$$\begin{array}{r}
 3.56 \\
 + 2.47 \\
 \hline
 6.03 \\
 1 \quad 1
 \end{array}$$

Addition with
negative
numbers

$$-15 + 6 = 9$$



Key Stage Three



Age Related
Expectations

- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
- perform mental calculations, including with mixed operations and large numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations

In Key Stage Three onwards, the methods and strategies taught in the primary schools during Key Stages One and Two, as outlined over the previous pages, continue to be embedded to develop fluency and understanding.

Subtraction -



subtract
subtraction
take away
take

less
less than
minus
reduce

fewer
count back
difference
how many left



Foundation Stage



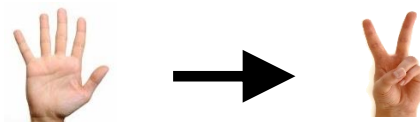
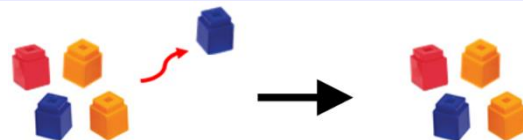
Age Related
Expectations

- Use the language of 'more' and 'fewer' to compare two sets of objects
- Finds one less from a group of up to five objects, then ten objects
- In practical activities and discussion, beginning to use the vocabulary involved in subtracting

Take away from
groups of items

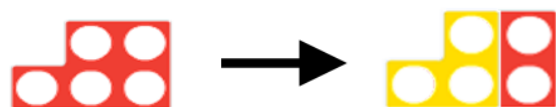
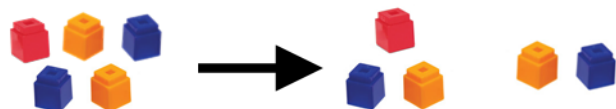


Find one less
than a number



Take away
using fingers
and other
practical
resources

(e.g. for 5 - 3)



cover

Taking away by
crossing out



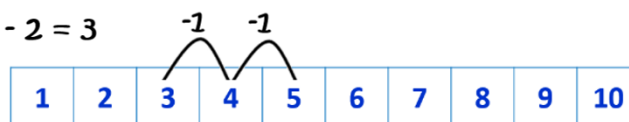
$$5 - 2 = 3$$

Introduction of
symbols to form
number sentences

$$5 - 2 = 3$$

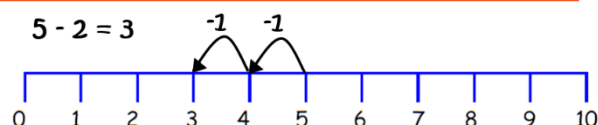
Counting back
on a number
track

$$5 - 2 = 3$$



Counting back
on a numbered
number line

$$5 - 2 = 3$$



Key Stage One



Age Related
Expectations

- solve subtraction problems using concrete objects and pictorially
- subtract 1 and 2-digit numbers using objects, pictorially and mentally
- show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- recognise and use the inverse relationship between addition and subtraction - use to check calculations and solve missing number problems

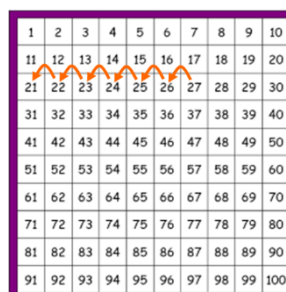


Developing
mental
methods

Children should apply their increasing knowledge of mental methods, subtract mentally, recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Counting back
in jumps of one
using a hundred
square

$$27 - 6$$



Using bead
strings to count
back by
bridging
through 10

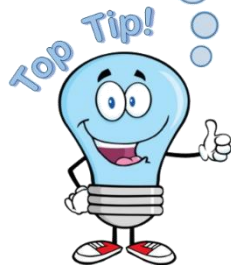
$$13 - 5$$



$$13 - 3 - 2$$

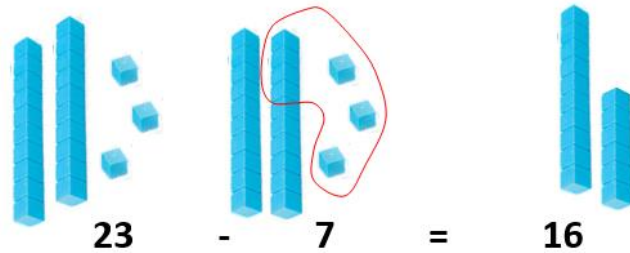


Children need to be familiar with the concept of exchanging tens for ten ones

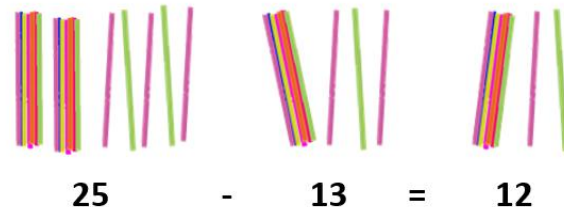


Subtraction using practical resources

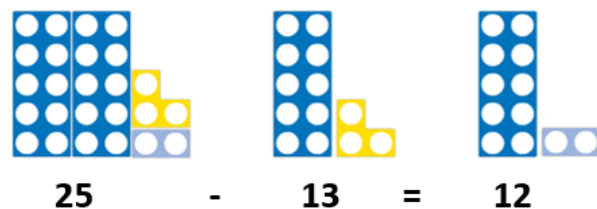
Dienes' Apparatus



Counting Straws



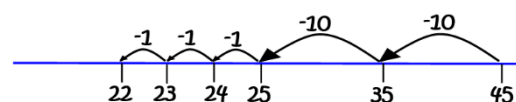
Numicon



Counting back in jumps of ten and one using a hundred square

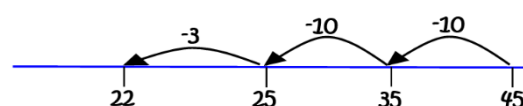
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

$$45 - 23 = 22$$



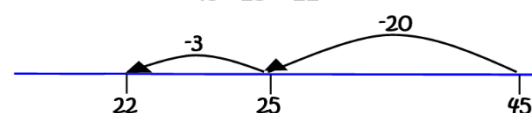
progressing to subtracting the ones in a single jump:

$$45 - 23 = 22$$



progressing to subtracting the tens in a single jump:

$$45 - 23 = 22$$



These strategies help to develop mental methods – apply these strategies mentally



Counting back on a blank number line

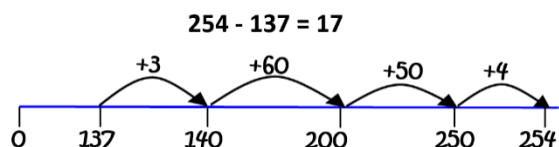
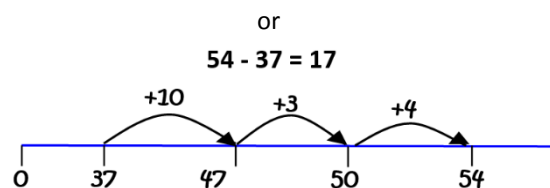
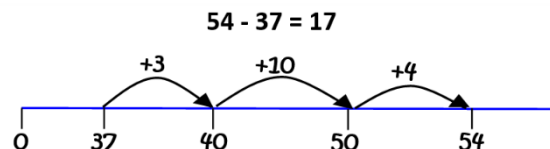


Scan to watch video

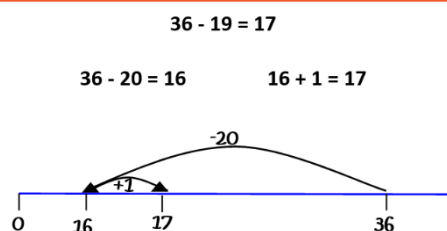


Finding a difference by counting on using a numberline

...progressing to hundreds for more able children



Subtracting 9 / 19 / 29 or 8 / 28 / 38 by compensation



Key Stage Two



Age Related Expectations

- Estimate the answer to a calculation and use the inverse operations to check answers
- Solve problems involving subtraction, including missing number problems, using number facts, place value and more complex subtraction
- Subtract increasingly large numbers mentally
- Solve multi-step subtraction problems, deciding which operation and method to use and why



Developing mental methods

Children should have regular practise of mental subtractions. Explore how children visualise numbers in their heads, and encourage them to use a variety of methods for manipulating the numbers.

Mental methods include partitioning and compensating:

e.g. $31 - 17$ as $31 - 10 - 7$

Using practical apparatus helps children understand what is happening

Top Tip!



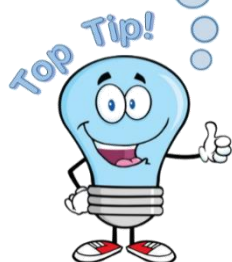
Subtraction using expanded written methods in a vertical layout

$$\begin{array}{r} 66 - 54 \\ \text{T} \quad \text{U} \\ 60 \quad 6 \\ - 50 \quad 4 \\ \hline 10 + 2 \rightarrow 12 \end{array}$$

Introduce practically, e.g



Don't use the terms 'borrowing' or 'stealing' in place of exchange as the quantity doesn't change, it is just represented differently



Subtraction using expanded written methods in a vertical layout involving exchange

$$81 - 57$$

T U	T U	T U
80 1	70 11	⁷⁰ 80 11
- 50 7	- 50 7	- 50 7
-----	20 + 4 → 24	20 + 4 → 24

Subtraction using compact written method

$$81 - 57$$

T U
⁷ 8 11
- 5 7

2 4

Scan to watch video



Subtraction using compact written method exchanging across columns

$$403 - 127$$

T U
³ 4 ⁹ 0 3
- 1 2 7

2 7 6

Scan to watch video



Subtraction of decimal numbers to 2 decimal places using compact written method

$$£2.31 - £1.53$$

¹ 2 ¹² 3 1
£ 1 . 5 3

£ 0 . 7 8

Subtraction using negative numbers

$$-12 - 4 = -16$$



Key Stage Three



Age Related Expectations

- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving subtraction
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
- perform mental calculations, including with mixed operations and large numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations

In Key Stage Three onwards, the methods and strategies taught in the primary schools during Key Stages One and Two, as outlined over the previous pages, continue to be embedded to develop fluency and understanding.

Multiplication x



times
multiply
multiplication

lots of
repeated addition

array
groups of
product



Foundation Stage

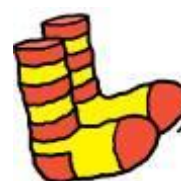


Age Related
Expectations

- Begin to identify own mathematical problems based on own interests and fascinations
- Solve problems including doubling

e.g. pairs of socks

Grouping
objects into
equal groups



Counting in
jumps – finding
patterns using a
hundred square

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Key Stage One



Age Related
Expectations

- calculate multiplication statements within the multiplication tables and write them using the multiplication ($\times$) sign
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve multiplication problems using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts



Developing
mental
methods

- Recall and use multiplication facts for the 2, 5 and 10 multiplication tables and begin to solve related problems mentally

Scan to watch video

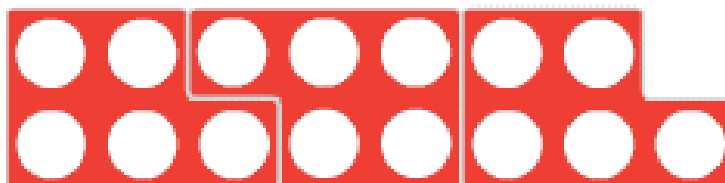


Repeated addition using practical resources

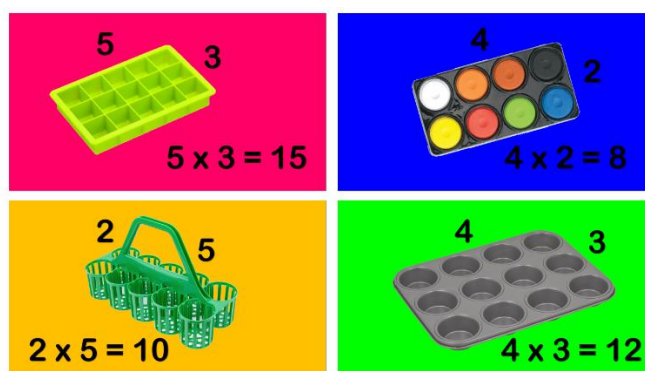
e.g. 3×5 using Cuisenaire rods



e.g. 3×5 using Numicon



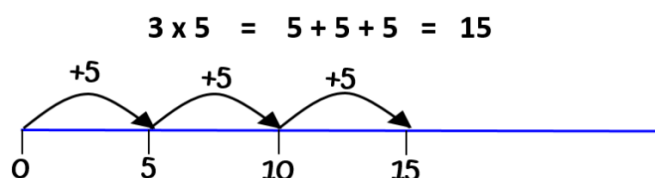
Arrays – using practical resources



Scan to watch video



Multiplication by repeated addition

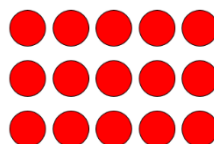


Drawing arrays using dots

Multiplication can be done in any order as the answer is the same – this is called commutativity

Using arrays

$$3 \times 5 = 15$$

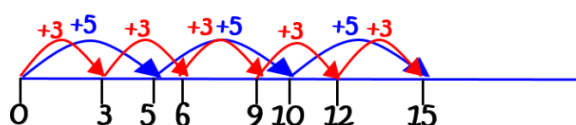


$$5 \times 3 = 15$$



For example 3×5 has the same answer as 5×3

Commutativity



Multiplying a 2-digit number by a 1-digit number:

Grid Method

x	20	3
4	80	24

$$80 + 24 = 104$$



Key Stage Two



Age Related Expectations

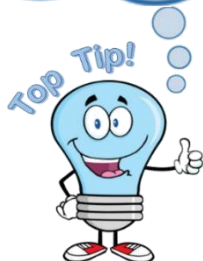
- Solve multiplication problems, including missing number problems
- Recall multiplication facts and tables for up to 12×12
- Use place value, known and derived facts to multiply and divide mentally, including multiply by 0 and 1
- Identify common factors, common multiples and prime numbers
- Multiply numbers up to 4 digits by a 1 or 2-digit number using a formal written method, including long multiplication for 2-digit numbers
- Multiply numbers mentally drawing upon known facts
- Multiply whole numbers and those involving decimals by 10, 100 and 1000
- Perform mental calculations, including with mixed operations and large numbers



Developing mental methods

Know by heart multiplication facts for $2x$, $3x$, $4x$, $5x$, $8x$, $10x$ tables and related division facts.

It is important that children know that when multiplying by ten it is not just a matter of adding a zero! The digits move left, and a place holder (0) may have to be inserted.



Grid Method

Multiplying a 2-digit number by a 1-digit number:

x	20	3
8	160	24

$$160 + 24 = 184$$

Multiplying a 3-digit number by a 1-digit number:

x	100	20	3
6	600	120	18

$$= 738$$

Multiplying two 2-digit numbers:

x	20	3
40	800	120
2	40	6

$$\longrightarrow 920$$

$$\longrightarrow 46$$

$$\underline{\hspace{1cm}} 966$$

Scan to watch video



Multiplying a 2-digit number by a 1-digit number:

Expanded Column Method	23	
	<u>x 7</u>	
	21	(3 x 7)
	<u>140</u>	(20 x 7)
	161	

Multiplying a 3-digit number by a 1-digit number:

Expanded Column Method	246	
	<u>x 7</u>	
	42	(6 x 7)
	280	(40 x 7)
	<u>1400</u>	(200 x 7)
	1722	

Multiplying a 2-digit number by a 1-digit number:

Contracted Column Method	23	
	<u>x 7</u>	
	<u>161</u>	
	2	

Multiplying a 3-digit number by a 1-digit number:

Contracted Column Method	246	
	<u>x 7</u>	
	<u>1722</u>	
	3 4	

Multiplying a 1-digit number by a 4-digit number:

Contracted
Column Method

$$\begin{array}{r} 3875 \\ \times 6 \\ \hline 23250 \\ 543 \end{array}$$

Multiplying a 2-digit number by a 2-digit number:

Long
Multiplication

$$\begin{array}{r} 72 \\ \times 38 \\ \hline 576 \\ 1 \\ \hline 2160 \\ 1 \\ \hline 2736 \end{array}$$

(8 x 72)
(30 x 72)

Multiplying numbers involving decimals:

Contracted
Column Method

$$\begin{array}{r} 118.35 \\ \times 4 \\ \hline 473.40 \\ 312 \end{array}$$



Key Stage Three



Age Related
Expectations

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- solve problems involving multiplication
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
- identify common factors, common multiples and prime numbers
- perform mental calculations, including with mixed operations and large numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations

In Key Stage Three onwards, the methods and strategies taught in the primary schools during Key Stages One and Two, as outlined over the previous pages, continue to be embedded to develop fluency and understanding. Additionally, the Gelosia method is taught as outlined here:

Step1:

For 35 x 19, draw a grid and write 35 across the top and 19 down the side.

For 35 x 19:

3	5	
		1
		9

Step 2:

Draw dashed lines as shown. In each cell, multiply together the two edge digits and write the answer as two digits in the square.

3	5	
0	0	1
2	4	9

Step 3:

Add up along the diagonals and write the results outside the square. Start at the right and carry extra digits as usual.

3	5	
0	0	1
2	4	9

Step 4:

Finally read off the totals you have worked out. Here they read 0665. Therefore, the answer is:

665

3	5	
0	0	1
2	4	9

Division ÷



divide
division
share

group
sort
remainder
left over

how many lots of
repeated subtraction
split



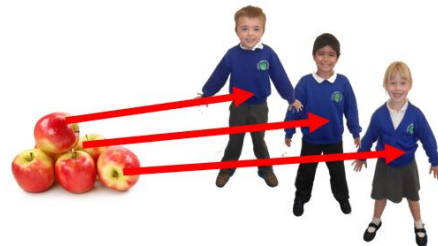
Foundation Stage



Age Related
Expectations

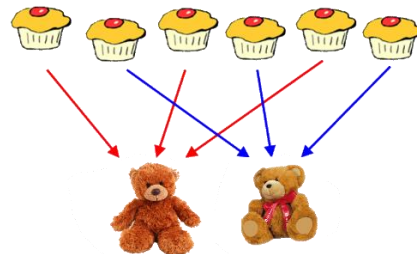
- Begin to identify own mathematical problems based on own interests and fascinations
- Solve problems including halving and sharing

Sharing between children



Sharing
equally

Solving physically



Key Stage One



Age Related
Expectations

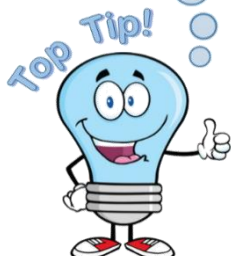
- calculate division statements and write them using the division (÷) sign
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve problems involving division, using materials, arrays, repeated subtraction, mental methods, and multiplication and division facts, including problems in contexts.



Developing
mental
methods

- recall and use division facts for the 2, 5 and 10 multiplication tables and begin to solve related problems mentally

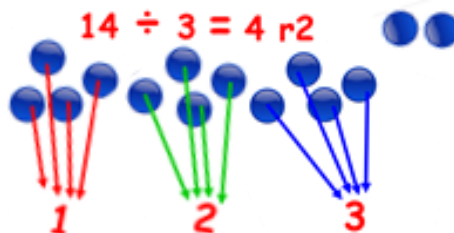
Remainders should be introduced early on and **NOT** be considered as a more difficult step for introducing later



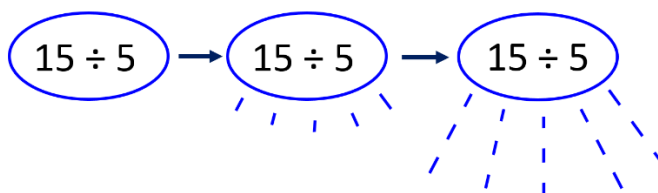
Sharing Spiders



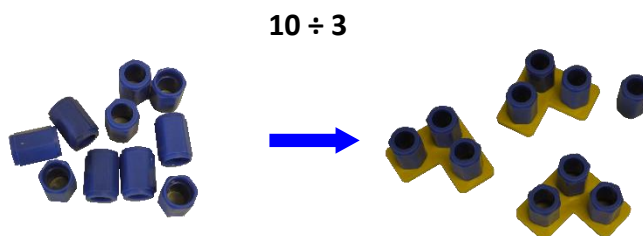
Sharing using e.g. counters



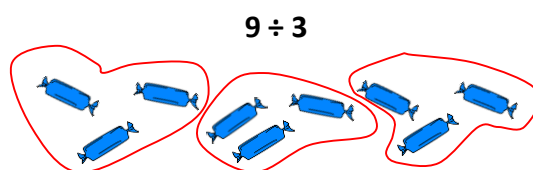
Sharing Showers



Grouping using Numicon



Grouping



Division using practical resources

e.g. How many 4's in 15?

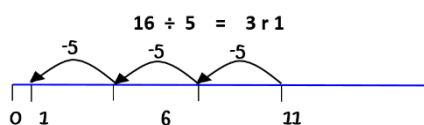


Using Cuissenaire Rods:



Repeated Subtraction

Using a number line:





Age Related Expectations

- Solve division problems, including missing number problems
- Be able to divide by 12
- Divide whole numbers and those involving decimals by 10, 100 and 1000
- Use the formal written methods of long and short division to divide numbers up to 4 digits by a 2-digit whole number
- Show remainders as whole numbers, fractions or by rounding
- Perform mental calculations, including with mixed operations and large numbers
- Identify common factors, common multiples and prime numbers

$$72 \div 4:$$

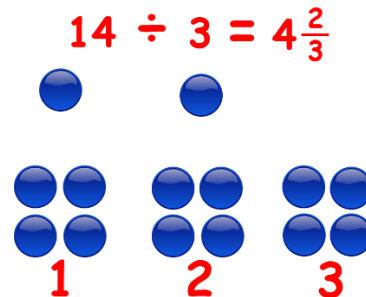
Dividing by partitioning

$$40 \div 4 = 10$$

$$32 \div 4 = 8$$

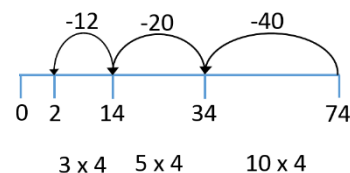
$$72 \div 4 = 18$$

Sharing representing remainders as fractions



Using a number line to take off chunks

$$74 \div 4$$



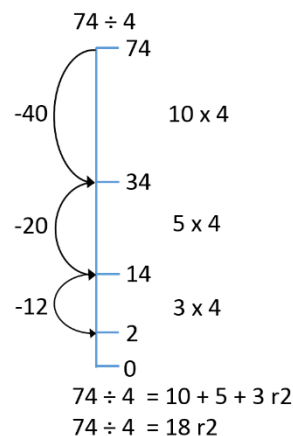
Repeated subtraction of chunks

$$74 \div 4 = 10 + 5 + 3 \text{ r}2$$

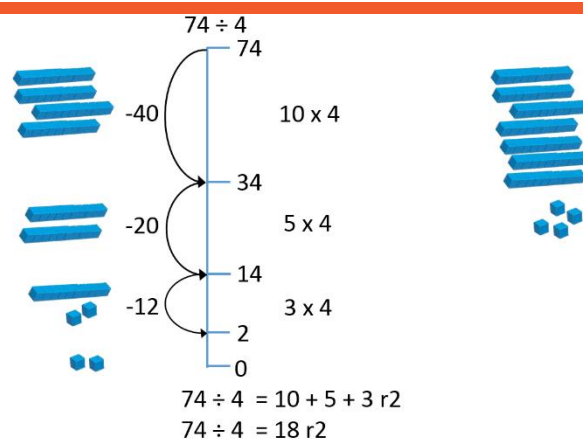
$$74 \div 4 = 18 \text{ r}2$$

The use of a vertical number line is a good link to introduce chunking.

Repeated subtraction of chunks on a vertical number line



Repeated subtraction of chunks on a vertical number line



Repeated subtraction of chunks, e.g.

Make a list of 'top tips' using previously learnt multiplication facts to help solve



Division by chunking

Top Tips

1 x 4 = 4
2 x 4 = 8
4 x 4 = 16
10 x 4 = 40
7 x 4 = 28

148 ÷ 4:

148
-40 (10 x 4)
108
-40 (10 x 4)
68
-40 (10 x 4)
28
-28 (7 x 4)
0

148 ÷ 4 = 10 + 10 + 10 + 7
148 ÷ 4 = 37

Repeated subtraction of chunks, e.g.

534 ÷ 17:

Division by chunking

Top Tips

1 x 17 = 17
2 x 17 = 34
4 x 17 = 68
10 x 17 = 170
5 x 17 = 85
20 x 17 = 340

534
-340 (20 x 17)
194
-170 (10 x 17)
24
-17 (1 x 17)
7

534 ÷ 17 = 20 + 10 + 1 r7
534 ÷ 17 = 31 r7

$$560 \div 24:$$

Long division

$$\begin{array}{r}
 24 \overline{) 560} \\
 \underline{48} \\
 80 \\
 \underline{72} \\
 8
 \end{array}
 \quad
 \begin{array}{l}
 24 \times 20 \\
 24 \times 3
 \end{array}$$

$$560 \div 24 = 28 \text{ r } 8$$

$$432 \div 15:$$

Long division
showing answer
as a fraction

$$\begin{array}{r}
 15 \overline{) 432} \\
 \underline{30} \\
 132 \\
 \underline{120} \\
 12
 \end{array}
 \quad
 \begin{array}{l}
 15 \times 20 \\
 15 \times 8
 \end{array}$$

$$\frac{12}{15} = \frac{4}{5}$$

$$432 \div 15 = 28 \frac{4}{5}$$

$$432 \div 15:$$

Long division
showing answer
as a decimal

$$\begin{array}{r}
 15 \overline{) 432.0} \\
 \underline{30} \downarrow \\
 132 \downarrow \\
 \underline{120} \downarrow \\
 120 \\
 \underline{120} \\
 0
 \end{array}$$

$$432 \div 15 = 28.8$$

$$432 \div 15 = 28.8$$

$$318 \div 3$$

Compact short
division

$$\begin{array}{r} 0 \quad 5 \quad 3 \\ 6 \overline{) 3 \quad ^3 1 \quad ^1 8} \end{array}$$

$$318 \div 3 = 53$$

$$560 \div 24$$

Compact short
division
showing answer
with a
remainder

$$\begin{array}{r} 0 \quad 2 \quad 3 \quad \text{r}8 \\ 2 \quad 4 \overline{) 5 \quad ^5 6 \quad ^8 0} \end{array}$$

$$318 \div 3 = 53$$

$$560 \div 24$$

Compact short
division
showing answer
as a decimal

$$\begin{array}{r} 0 \quad 2 \quad 3 \quad . \quad 3 \quad 3 \\ 2 \quad 4 \overline{) 5 \quad ^5 6 \quad ^8 0 \quad . \quad ^8 0 \quad ^8 0} \end{array}$$

$$318 \div 3 = 53$$

$$15.4 \div 4$$

Compact short
division of
decimal
numbers

$$\begin{array}{r} 3 \quad . \quad 8 \quad 5 \\ 4 \overline{) 1 \quad ^1 5 \quad . \quad ^3 4 \quad ^2 0} \end{array}$$

Division
involving
negative
numbers

$$-40 \div 8 = -5$$

$$-40 \div -8 = 5$$

Key Stage Three



Age Related Expectations

- 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
- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- solve problems involving division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
- identify common factors, common multiples and prime numbers
- perform mental calculations, including with mixed operations and large numbers
- use knowledge of the order of operations to carry out calculations involving the 4 operations

In Key Stage Three onwards, the methods and strategies taught in the primary schools during Key Stages One and Two, as outlined over the previous pages, continue to be embedded to develop fluency and understanding.

Glossary of Terms

Array	An ordered collection of counters, numbers etc. in rows and columns.
Commutativity	Multiplication and division are both commutative as they can be done in any order. Division and subtraction are not commutative.
Difference	The amount by which one number or value is greater than another, obtained by subtracting the smaller from the larger.
Hundred Square	The numbers 1 – 100 arranged in uniform rows and columns to aid the understanding of number and to assist with calculations.
Inverse operation	The inverse operation is that which reverses the effect of the other one. Addition and subtraction are inverse operations. Multiplication and division are inverse operations.
Logical	Using an approach that is structured, logical, clear and organised to solve a given problem or calculation.
Manipulatives	Manipulatives are objects which are designed so that a learner can perceive some mathematical concept by manipulating them. The use of manipulatives provides a way for children to learn concepts in a developmentally appropriate, hands-on way.
Mental Methods	Using methods and strategies in your head to solve a given problem.
Multiple	When two numbers are multiplied together, the result is called a multiple.
Number bonds	A pair of numbers with a particular total e.g. number bonds to ten are all pairs of whole numbers with the total 10.
Number sentence	A mathematical sentence involving numbers. For example: $3 + 6 = 9$.
Number line	A line where numbers are represented by points upon it.
Partition	To split a number into component parts. For example: the two-digit number 38 can be partitioned into $30 + 8$ or $19 + 19$.
Place Value	The value of a digit that relates to its position or place in a number. For example: in 1482 the digits represent 1 thousand, 4 hundreds, 8 tens and 2 ones respectively.
Product	The result of multiplying two or numbers together.
Remainders	What is 'left over' when one number cannot be exactly divided by another.

Useful Websites

There are many websites which can be used to support your child's learning in maths. The following websites are some of those used across our schools:



National Curriculum
tinyurl.com/NatCur2014



nrich
nrich.maths.org



National Centre for Excellence
in the Teaching of Mathematics
ncetm.org.uk



Mathletics
mathletics.co.uk



BBC Bitesize
bbc.co.uk/bitesize



Crickweb Maths
crickweb.co.uk



Topmarks Maths
topmarks.co.uk



ICT games
ictgames.com



Primary Games
primarygames.com



This calculations policy
has been written by the
Mathematics Lead
Teachers from Bere
Regis Primary School,
Lytchett Matravers
Primary School,
Lytchett Minster
School, Sandford
Primary School, Upton
Infant School and
Upton Junior School.

