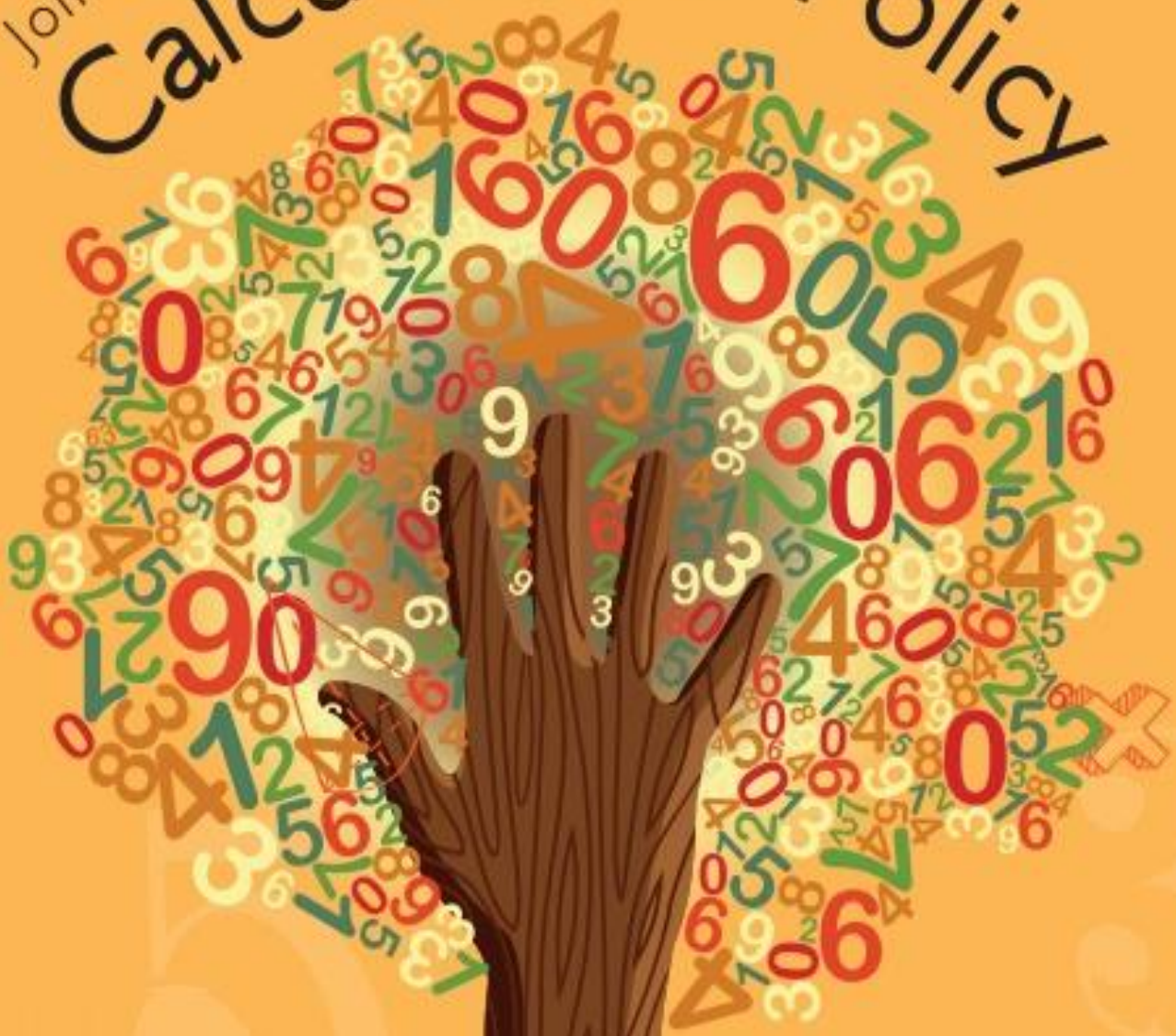
Joint Pyramid Maths

Calculations Policy



Sandford St. Martin's

ABOUT THIS POLICY

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.

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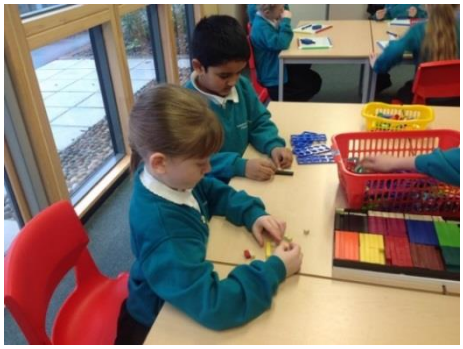
We are grateful for the advice from Jennie Fellowes, Dorset Local Authority's Primary Mathematics Advisor in writing this policy.

INTRODUCTION

The following calculations policy 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.

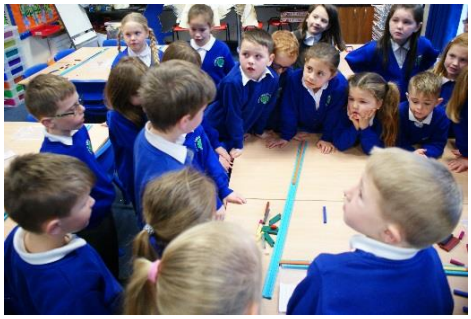
AIMS OF THE POLICY

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.

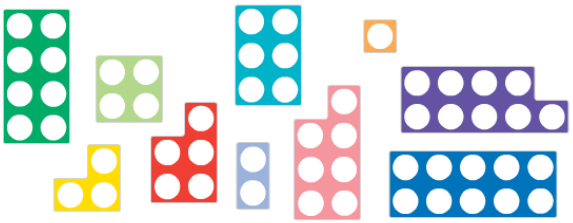
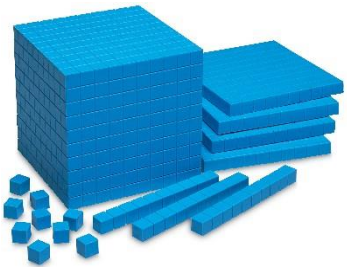
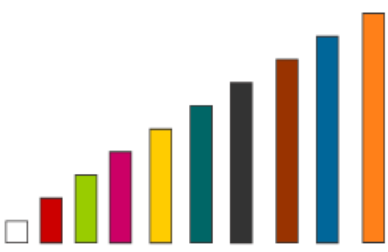
Scan to watch video

Take a look at videos created by the teachers and children of our schools, explaining how to use different opperations 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

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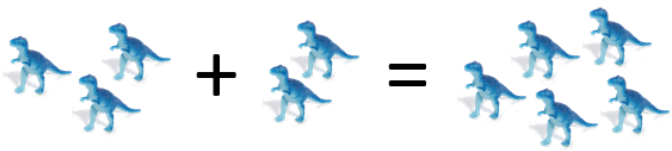
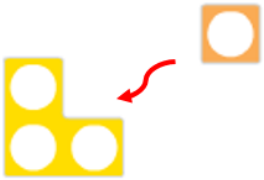
Begin to relate addition to combining sets of items together

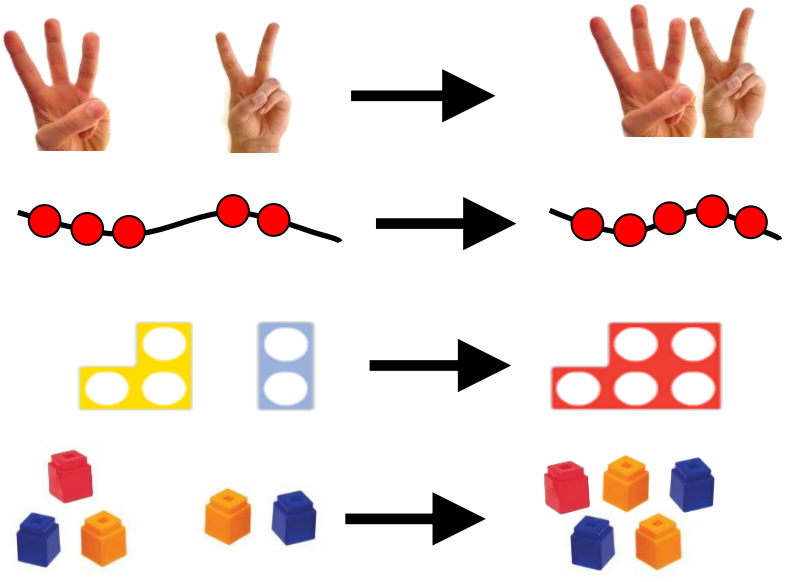


Find one more than a number



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

Adding using fingers and other practical resources

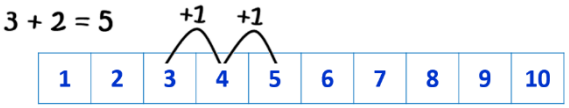


Introduction of symbols to form number sentences

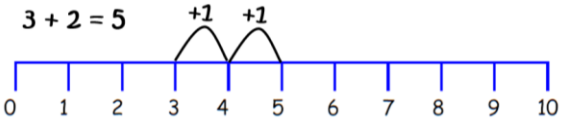
3 + 2 = 5

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 = ☐ – 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

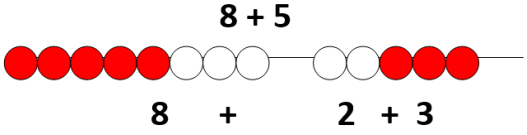
Mental additon and fluency is developed through frequent practise of strategies taught, including addition facts to 20 and related facts to 100, and addition of 1 and 2-digit numbers (including three 1-digit numbers).

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



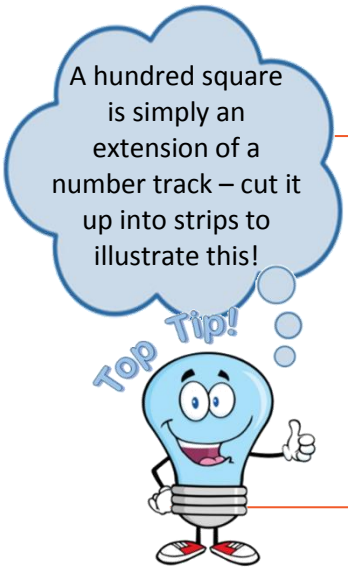
Understand that addition is commutative (can be done in any order)

3 + 2 = 5 or 2 + 3 = 5

Vary position of missing numbers in a number sentence

2 + ☐ = 5

☐ + 4 = 7



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

13 + 12 = 25

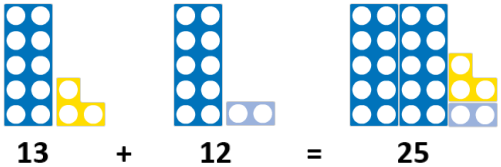
Scan to watch video

Addition of 2-digit numbers using practical resources

Counting Straws

13 + 12 = 25

Numicon



13 + 12 = 25

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

32 + 26

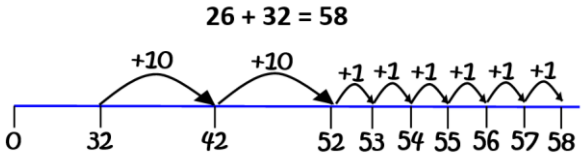
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Vary position of missing numbers in a number sentence

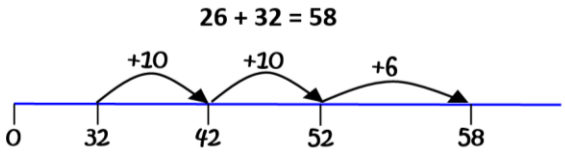
2 1 + ☐ = 43

☐ + 32 = 58

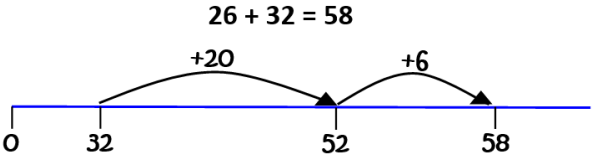
Addition using a blank number line (putting biggest number first)



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 (add the tens)

56 + 2 = 58 (add the ones)

Adding by partitioning into tens and ones

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

Adding by partitioning into tens and ones

T O T O

26 + 32

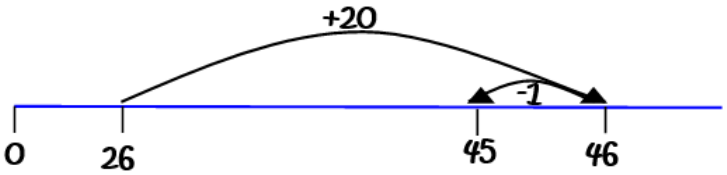
50 + 8 = 58

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

Adding by compensation

26 + 19 = 45

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

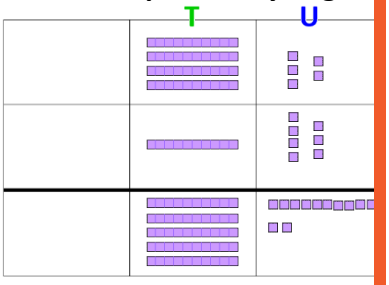
Children should have regular practise of mental addition, including multiple numbers. Explore how children visualise numbers in their heads, and encourage them to use a variety of methods for manipulating numbers. They should be able to add 3 1-digit numbers mentally and any pair of 2-digit numbers mentally,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

Begin to use expanded written methods

45 + 17

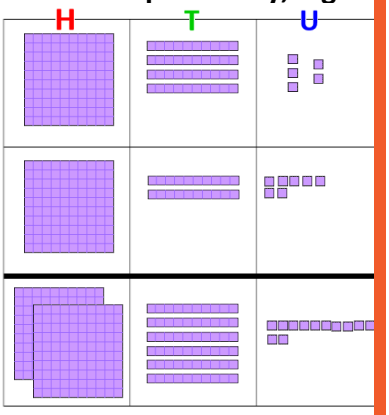
	T	U	
	40	5	
+	10	7	
	50 + 12		62

Introduce practically, e.g.



Progress to expanded written methods involving hundreds

Introduce practically, e.g.

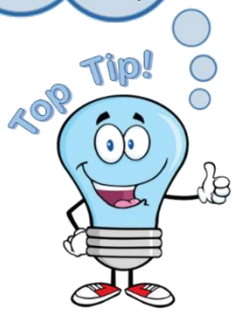


145 + 127

H	T	U	
100	40	5	
+ 100	20	7	
200	+ 60	+ 12	272

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



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

264 + 148

	H	T	U
	2	6	4
+	1	4	8
	4	1	2
	1	1	

Addition using the compact written method progressing to thousands

3364 + 247

	H	T	U	
	3	3	6	4
+		2	4	7
	3	6	1	1
		1	1	

Addition involving decimals using compact written methods

3.56 + 2.47

	3	.	5 6
+	2	.	4 7
	6	.	0 3
	1		1

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	less	fewer
subtraction	less than	count back
take away	minus	difference
take	reduce	how many left

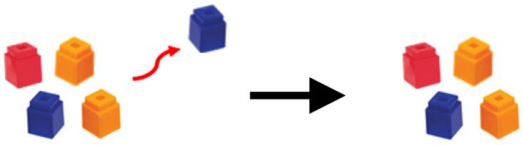
Foundation Stage

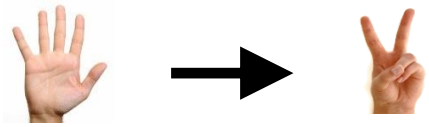
Age Related Expectations

- 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

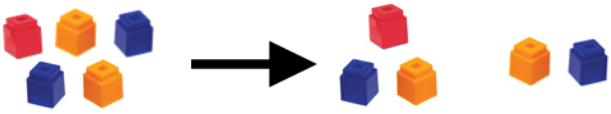
Find one less than a number

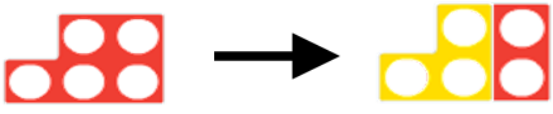




Take away using fingers and other practical resources

(e.g. for 5 - 3)





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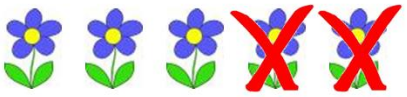
Taking away by crossing out

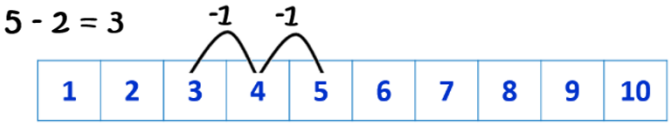


5 – 2 = 3

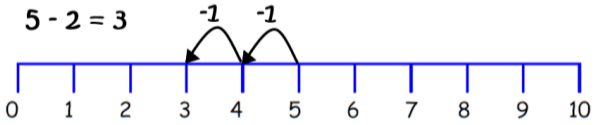
Introduction of symbols to form number sentences

5 - 2 = 3

Counting back on a number track



Counting back on a numbered number line



Key Stage One

Age Related Expectations

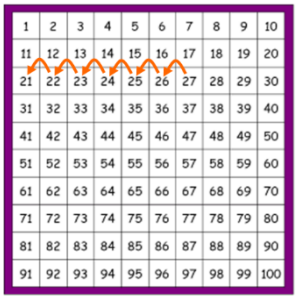
- solve subtraction problems using concrete objects and pictorially
- subtract 1 and 2-digit numbers using objects, pictorially and mentally
- show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- recognise and use the inverse relationship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



1	2	3	4	5	6	7	8	9	10
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81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Using bead strings to count back by bridging through 10

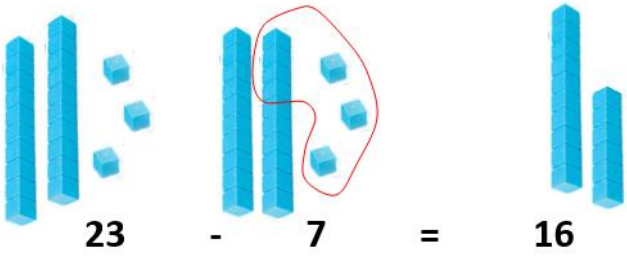
13 - 5

13 - 3 - 2

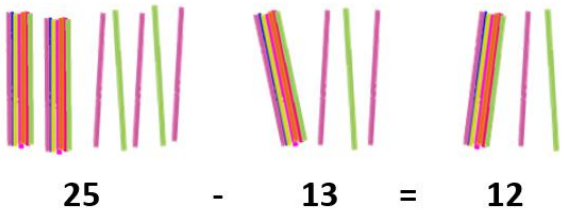
Children need to be familiar with the concept of exchanging tens for ten ones

Subtraction using practical resources

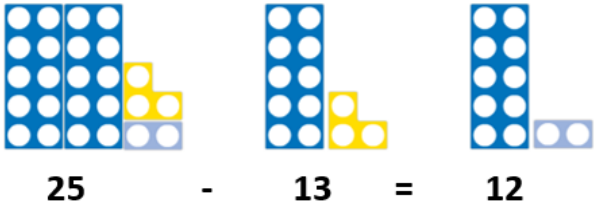
Dienes' Apparatus



Counting Straws

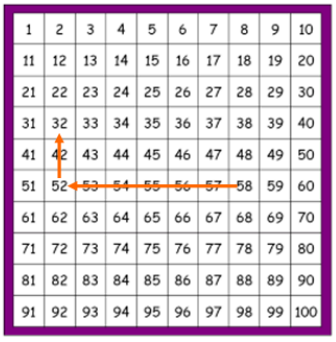


Numicon



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

58 - 26

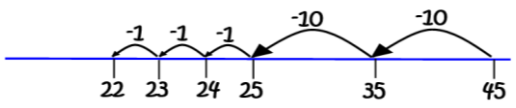


1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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

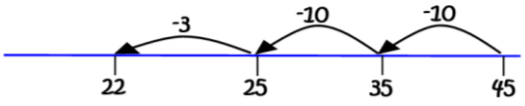
Counting back on a blank number line

45 - 23 = 22



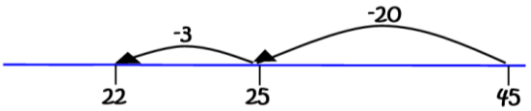
progressing to subtracting the ones in a single jump:

45 - 23 = 22



progressing to subtracting the tens in a single jump:

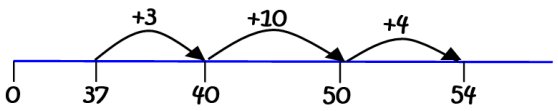
45 - 23 = 22



Scan to watch video

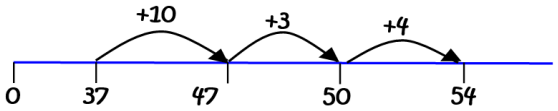
Finding a difference by counting on using a numberline

54 - 37 = 17



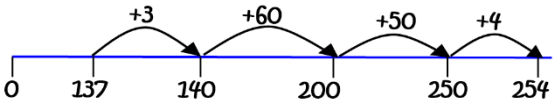
or

54 - 37 = 17



…progressing to hundreds for more able children

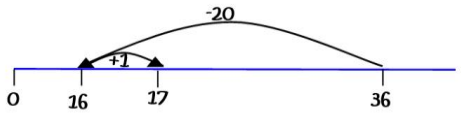
254 - 137 = 17



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

36 - 19 = 17

36 - 20 = 16 16 + 1 = 17



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**

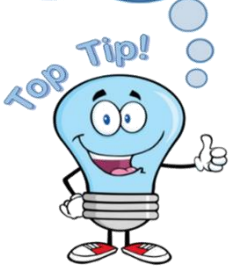
Developing mental methods

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



Subtraction using expanded written methods in a vertical layout

66 - 54

	T	U
	60	6
-	50	4
	10 + 2 →	12

Introduce practically, e.g

66

take away 54

leaves

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 excchange

81 - 57

T	U
80	1
- 50	7

→

T	U
70	11
- 50	7
20 + 4	→ 24

...recorded as

T	U
~~7~~0	11
- 50	7
20 + 4	→ 24

Subtraction using compact written method

81 – 57

T	U
~~7~~ 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~~ ~~0~~ 9		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

£ ~~2~~ 1 . ~~3~~ 12			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

Grouping objects into equal groups

e.g. pairs of socks

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 (×) 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

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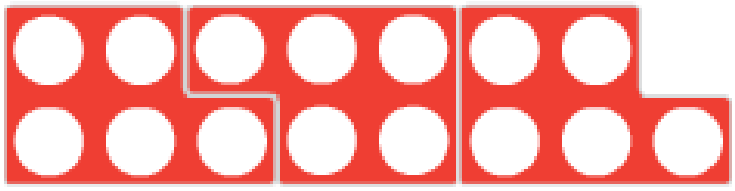
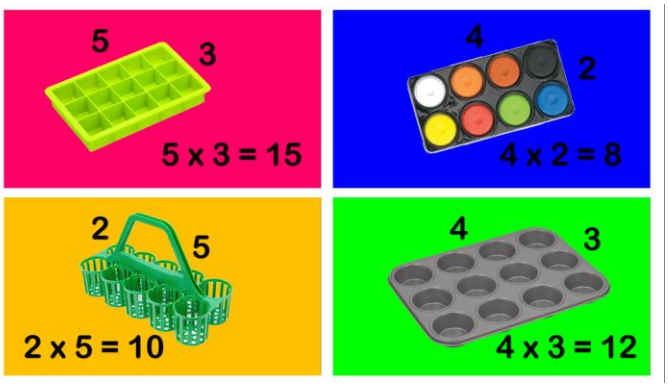
Repeated addition using practical resources

e.g. 3 x 5 using Cuisennaire rods

e.g. 3 x 5 using Numicon



Arrays – using practical resources



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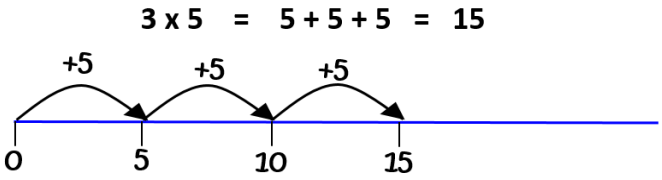
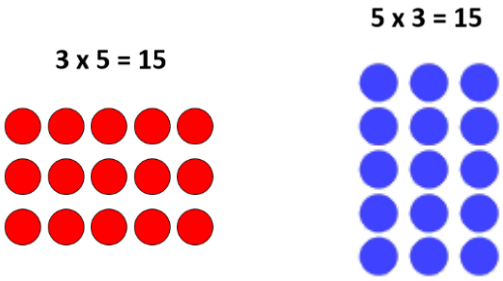
Multiplication by repeated addition

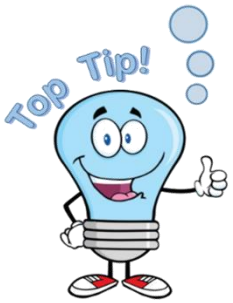


Multiplication can be done in any order as the answer is the same – this is called commutativity

Using arrays

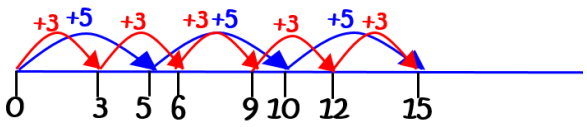
Drawing arrays using dots





Commutativity

For example **3 x 5** has the same answer as **5 x 3**



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 x 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 100
- 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.

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:

Grid Method

x	100	20	3
6	600	120	18

= 738

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Multiplying two 2-digit numbers:

x	20	3
40	800	120
2	40	6

→ 920

→ 46

966

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

Expanded Column Method

$$\begin{array}{rl} 23 & \\ \times\ 7 & \\ \hline 21 & (3 \times 7) \\ 140 & (20 \times 7) \\ \hline 161 & \end{array}$$

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

Expanded Column Method

$$\begin{array}{rl} 246 & \\ \times\ 7 & \\ \hline 42 & (6 \times 7) \\ 280 & (40 \times 7) \\ 1400 & (200 \times 7) \\ \hline 1722 & \end{array}$$

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

Contracted Column Method

$$\begin{array}{r} 23 \\ \times\ 7 \\ \hline 161 \\ \scriptstyle 2 \end{array}$$

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

Contracted Column Method

$$\begin{array}{r} 246 \\ \times\ 7 \\ \hline 1722 \\ \scriptstyle 3\ 4 \end{array}$$

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

Contracted Column Method

$$\begin{array}{r} 3875 \\ \times \quad 6 \\ \hline 23250 \\ \scriptstyle 5\ 4\ 3 \end{array}$$

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

Long Multiplication

$$\begin{array}{rl} 72 & \\ \times \quad 38 & \\ \hline 576 & (8 \times 72) \\ \scriptstyle 1 & \\ 2160 & (30 \times 72) \\ \hline 2736 & \\ \scriptstyle 1 & \\ \hline \end{array}$$

Multiplying numbers involving decimals:

Contracted Column Method

$$\begin{array}{r} 118.35 \\ \times \quad 4 \\ \hline 473.40 \\ \scriptstyle 3\ 1\ 2 \end{array}$$

Key Stage Three

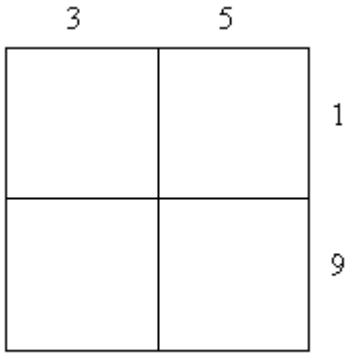
Age Related Expectations

- 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

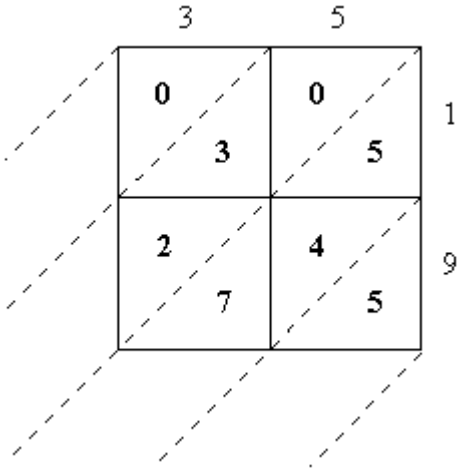
In Key Stage Three onwards, the methods and strategies taught in the primary schools during Key Stages One and Two, as outlined over the previous pages, continue to be embedded to develop fluency and understanding. Additionally, the Gelosia method is taught as outlined here:

For 35 x 19:

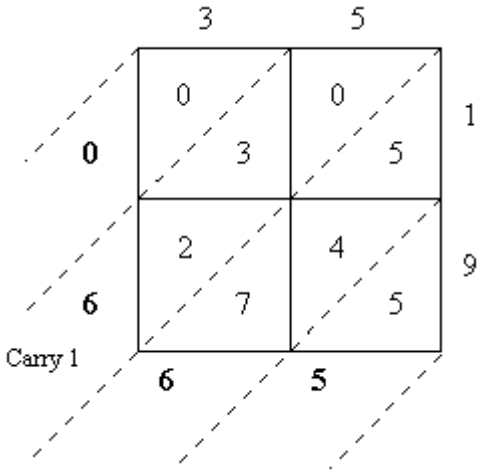
Step1: For 35 x 19, draw a grid and write 35 across the top and 19 down the side.



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 sqaure.

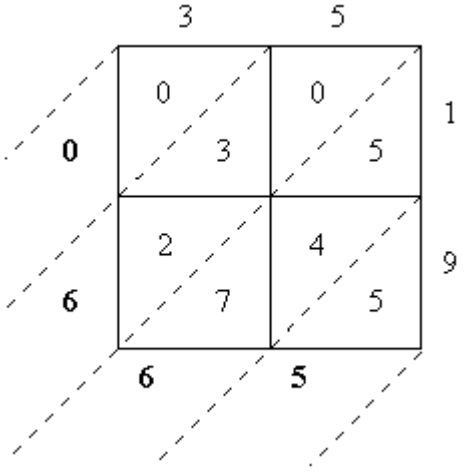


Step 3: Add up along the diagonals and write the results outside the square. Start at the right and carry extra digits as usual.



Step 4: Finally read off the totals you have worked out. Here they read 0665. Therefore, the answer is:

665



Division ÷

divide
division
share

group
sort
remainder
left over

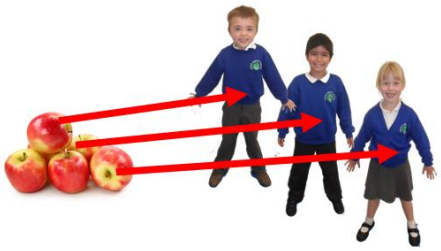
how many lots of
repeated subtraction
split

Foundation Stage

Age Related Expectations

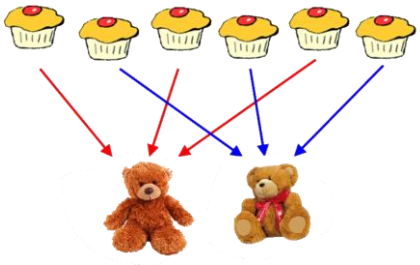
- Begin to identify own mathematical problems based on own interests and fascinations
- Solve problems including halving and sharing

Sharing between children



Sharing equally

Solving physically



Key Stage One

Age Related Expectations

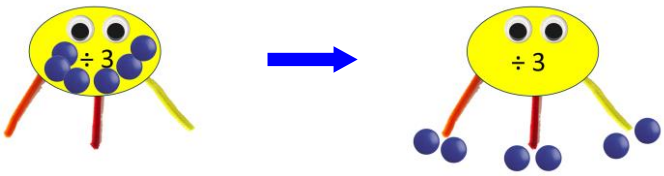
- calculate division statements and write them using the division (÷) sign
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve problems involving division, using materials, arrays, repeated subtraction, mental methods,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

Developing mental methods

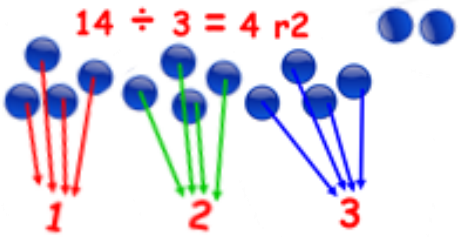
- recall and use division facts for the 2, 5 and 10 multiplication tables and begin to solve related problems mentally

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

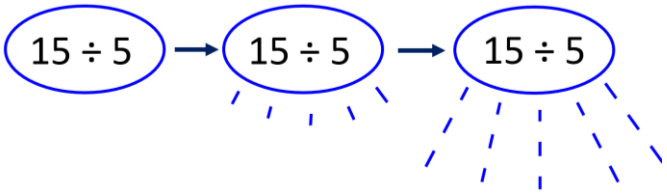
Sharing Spiders



Sharing using e.g. counters



Sharing Showers



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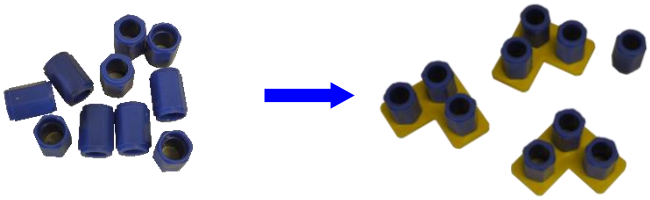
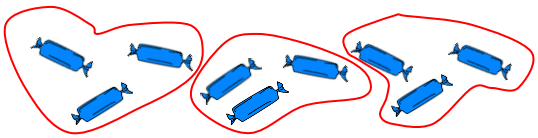
Grouping using Numicon

10 ÷ 3



Grouping

9 ÷ 3



Division using practical resources

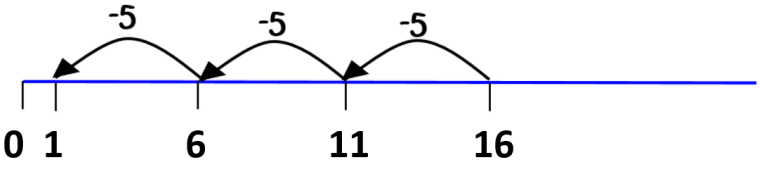
e.g. How many 4's in 15?

Repeated Subtraction

Using Cuisenaire Rods:

Using a number line:

16 ÷ 5 = 3 r 1



Key Stage Two

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**

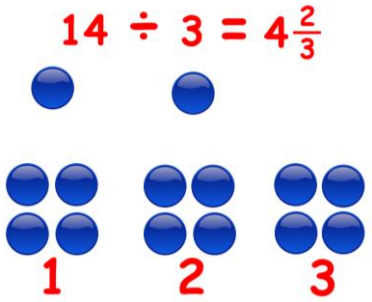
72 ÷ 4:

Dividing by partitioning

40 ÷ 4 = 10
32 ÷ 4 = 8

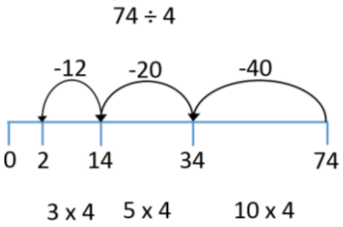
72 ÷ 4 = 18

Sharing representing remainders as fractions



Using a number line to take off chunks

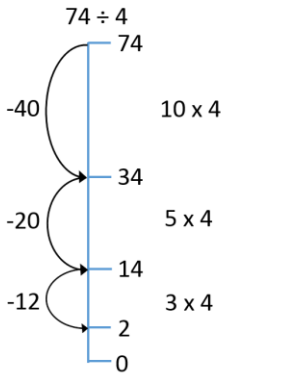
Repeated subtraction of chunks



74 ÷ 4 = 10 + 5 + 3 r2
74 ÷ 4 = 18 r2

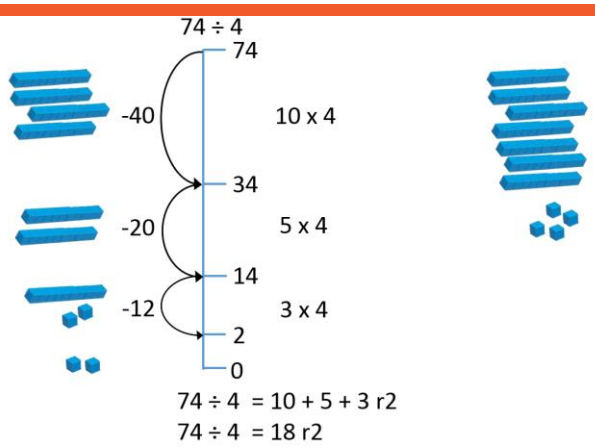
The use of a vertical number line is a good link to introduce chunking.

Repeated subtraction of chunks on a vertical number line



74 ÷ 4 = 10 + 5 + 3 r2
74 ÷ 4 = 18 r2

Repeated subtraction of chunks on a vertical number line



Repeated subtraction of chunks, e.g.

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

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

Repeated subtraction of chunks, e.g.

534 ÷ 17:

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

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

Long division

560 ÷ 24:

			2	8	
2	4	5	6	0	
	-	4	8	0	24 x 20
			8	0	
	-		7	2	24 x 3
				8	

560 ÷ 24 = 28 r 8

Long division showing answer as a fraction

432 ÷ 15:

			2	8	
1	5	4	3	2	
	-	3	0	0	15 x 20
		1	3	2	
	-	1	2	0	15 x 8
			1	2	

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

432 ÷ 15 = 28 $\frac{4}{5}$

Long division showing answer as a decimal

432 ÷ 15:

			2	8	. 8	
1	5	4	3	2	. 0	
	-	3	0	↓		
		1	3	2		
	-	1	2	0	↓	
			1	2	0	
			1	2	0	
					0	

432 ÷ 15 = 28.8

432 ÷ 15 = 28.8

Compact short division

$$318 \div 3$$

$$\begin{array}{r|l} & 0\ 5\ 3 \\ \hline 6 & 3^{3}\,1^{1}\,8 \end{array}$$

$$318 \div 3 = 53$$

Compact short division showing answer with a remainder

$$560 \div 24$$

$$\begin{array}{r|l} & 0\ 2\ 3\ \ r8 \\ \hline 24 & 5^{5}\,6^{8}\,0 \end{array}$$

$$318 \div 3 = 53$$

Compact short division showing answer as a decimal

$$560 \div 24$$

$$\begin{array}{r|l} & 0\ 2\ 3\ .\ 3\ 3 \\ \hline 24 & 5^{5}\,6^{8}\,0\ .^{8}\,0\,^{8}\,0 \end{array}$$

$$318 \div 3 = 53$$

Compact short division of decimal numbers

$$15.4 \div 4$$

$$\begin{array}{r|l} & 3\ .\ 8\ 5 \\ \hline 4 & 1^{1}\,5\ .^{3}\,4\,^{2}\,0 \end{array}$$

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	Addition and multiplication 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:

Department for Education

National Curriculum
tinyurl.com/NatCur2014

nrich
enriching mathematics

nrich
nrich.maths.org

National Centre for Excellence in the Teaching of Mathematics

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

Mathletics

Mathletics
mathletics.co.uk

BBC Bitesize

BBC Bitesize
bbc.co.uk/bitesize

Crickweb.co.uk

Crickweb Maths
crickweb.co.uk

Topmarks

Topmarks Maths
topmarks.co.uk

ict games

ICT games
ictgames.com

PrimaryGames

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.