



St Nicholas-at-Wade Primary School

Calculation Policy

Introduction

As a school we recognise the important link between mental, practical and written methods to support the development of children's understanding. Children are introduced to the processes of calculation through practical, oral and mental activities. As they begin to understand the underlying ideas, they develop ways of recording to support their thinking and calculation methods, so that they develop both conceptual understanding and fluency in the fundamentals of mathematics. Whilst interpreting signs and symbols involved with calculation, orally in the first instance, children use models and images to support their mental and written methods of calculation. As children's mental methods are strengthened and refined they begin to work more efficiently, which will support them with using succinct written calculation strategies as they are developed.

By the time children leave St Nicholas-at-Wade Primary School they will be equipped with efficient mental and written calculation methods, which they use with fluency. Decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. At whatever stage in their learning, and whatever method is being used, children's strategies must still be underpinned by a secure understanding and knowledge of number facts that can be recalled fluently.

The overall aims are that when children leave St Nicholas-at-Wade Primary School they:

- Are able to recall number facts with fluency, having developed conceptual understanding through being able to visualise key ideas – such as those related to place value – through experience with practical equipment and visual representation.
- Make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads.
- Have an efficient, reliable, written method of calculation for each number operation that they can apply with confidence when undertaking calculations that they cannot carry out mentally.
- Are able to make connections between all four number operations, understanding how they relate to one another, as well as how the rules and laws of arithmetic can be applied.

Mental Methods of Calculation

Oral and mental work in mathematics is essential, particularly so in calculation. Early practical, oral and mental work must lay the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. Later work must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. On-going oral and mental work provides practice and consolidation of these ideas. It must give children the opportunity to apply what they have learned to particular cases, exemplifying how the rules and laws work, and to general cases where children make decisions and choices for themselves.

The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined in order to develop fluency. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images and the application of acquired number knowledge and skills.

Written Methods of Calculation

In line with the National Curriculum 2014, our emphasis is on ensuring that pupils progress quickly towards efficient methods. This guidance promotes the use of what are commonly known as 'formal' written methods – methods that are efficient and work for any calculations, including those that involve whole numbers or decimals. They are compact and consequently help children to keep track of their recorded steps. Being able to use these written methods gives children an efficient set of tools they can use when they are unable to carry out the calculation in their heads or do not have access to a calculator. We want children to know that they have a reliable and efficient written method to apply to calculations.


In setting out these aims, the intention is that we adopt greater consistency in our approach to calculation. The challenge is for our teachers to determine when their children should move on to a refinement in the method and know when it is best to use a mental, written or calculator method based on the knowledge that they are in control of this choice as they are able to carry out all three methods with confidence.

We value the communication between teachers and pupils and pupils and their peers. When children feel confident to communicate their ideas and discuss their findings openly this improves their level of understanding. It has been proved that children will remember 70% of what they have been learning if they have taken an active part in the lesson, compared to a passive learner who will only retain 20% of what has been taught.

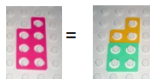
Fundamental Foundations

There are fundamental skills that are important for children to develop the building blocks to future learning in maths, including those linked to calculation. These will be taught initially in EYFS/Year 1 but also revisited throughout KS1 and KS2 to ensure depth of understanding. These skills include:

- **Ordinality** - 'the ordering of numbers in relation to one another' – e.g. (1, 2, 3, 4, 5...)

- **Cardinality** - 'understanding the value of different numbers' – e.g. (7 = )

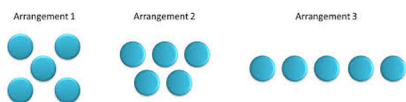
- **Equality** - 'seven is the same value as four add three' e.g.



- **Subitising** - 'instantly recognizing the number of objects in a small group, without counting them'



- **Conservation of Number** - 'recognising that a value of objects are the same, even if they are laid out differently'



- **Counting on and back from any number** e.g. five add three more totals eight



- **Using apparatus and objects to represent and communicate thinking** e.g.



- **Maths language** - using mathematical words verbally in every-day situations

Concrete, Pictorial and Abstract

The Concrete Pictorial Abstract (CPA) approach is a system of learning that uses physical and visual aids to build a child's understanding of abstract topics.

Pupils are introduced to a new mathematical concept through the use of **concrete** resources (e.g. fruit, Dienes blocks etc). When they are comfortable solving problems with physical aids, they are given problems with pictures – usually **pictorial representations** of the concrete objects they were using.

Then they are asked to solve problems where they only have the **abstract** i.e. numbers or other symbols. Building these steps across a lesson can help pupils better understand the relationship between numbers and the real world, and therefore helps secure their understanding of the mathematical concept they are learning



Addition and Subtraction Progression

Year One

- read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including 0
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$

Year Two

- solve problems with addition and subtraction:
 - using concrete objects and pictorial representations, including those involving numbers, quantities and measures
 - applying their increasing knowledge of mental and written methods
- recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
 - a two-digit number and 1s
 - a two-digit number and 10s
 - 2 two-digit numbers
 - adding 3 one-digit numbers
- show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

Year Three

- add and subtract numbers mentally, including:
 - a three-digit number and 1s
 - a three-digit number and 10s
 - a three-digit number and 100s
- add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Year Four

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Year Five

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Year Six

- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy



ADDITION

Year One

National Curriculum Objectives

read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs

represent and use number bonds and related subtraction facts within 20

add and subtract one-digit and two-digit numbers to 20, including 0

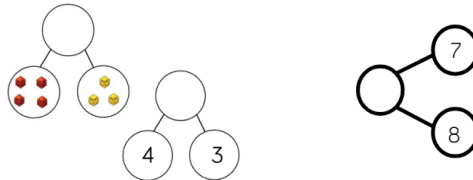
solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$



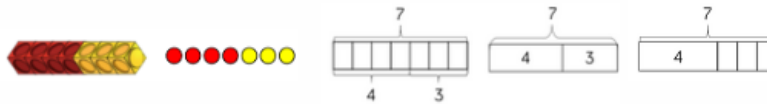
Mental Calculation Strategies

- 1 more
- 2 more
- 10 more
- largest number first
- doubles to 12
- near doubles to 10
- using number bonds

Part-Whole Model



Bar Model



Number Lines





ADDITION

Year Two

National Curriculum Objectives

solve problems with addition and subtraction:

- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods

recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- a two-digit number and 1s
- a two-digit number and 10s
- 2 two-digit numbers
- adding 3 one-digit numbers

show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot

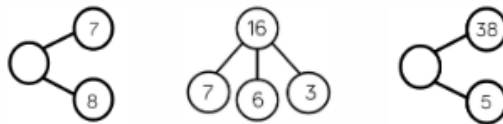
recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems



Mental Calculation Strategies

- 10 more
- number bonds 20, 12, 13, 14, 15, 16, 17, 18, 19
- add a one-digit number to two-digit number by bridging
- partition second number, add tens then ones
- add 10 and multiples
- doubles up to 20 and multiples of 5
- add near multiples of 10
- partition and recombine
- using known facts

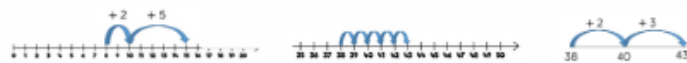
Part-Whole Model



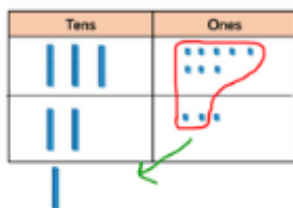
Bar Model



Number Lines



Base 10/Dienes



Column Method

T	U		38
	:		+ 23
	:	—	61
	:		1
4	3		

Preferred Method



ADDITION

Year Three

National Curriculum Objectives

add and subtract numbers mentally, including:

- a three-digit number and 1s
- a three-digit number and 10s
- a three-digit number and 100s

add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction

estimate the answer to a calculation and use inverse operations to check answers

solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Mental Calculation Strategies



- add multiples of 10, 100
- add single digit bridging through boundaries
- partition second number to add pairs of 100
- use near doubles to add
- add near multiples of 10 and 100 by rounding
- partition and recombine
- using known facts

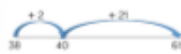
Part-Whole Model



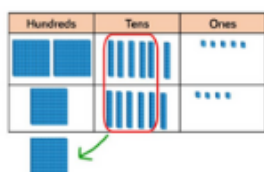
Bar Model



Number Lines



Base 10/Dienes



Column Method

$$\begin{array}{r} 38 \\ + 23 \\ \hline 61 \\ 1 \end{array} \qquad \begin{array}{r} 265 \\ + 164 \\ \hline 429 \\ 1 \end{array}$$

Preferred Method



ADDITION

Year Four

National Curriculum Objectives

add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate

estimate and use inverse operations to check answers to a calculation

solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Mental Calculation Strategies



- add multiples of 10s, 100s and 1000s
- fluency of 2-digit + 2-digit
- partition second number to add decimal pairs of 10 and 1
- use near doubles to add
- adjust both numbers before adding
- add near multiples
- partition and recombine
- using known facts

Part-Whole Model



Bar Model



Base 10/Dienes



Column Method

$$\begin{array}{r} 1378 \\ + 2148 \\ \hline 3526 \\ 11 \end{array}$$

Preferred Method



ADDITION

Year Five

National Curriculum Objectives

add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

add and subtract numbers mentally with increasingly large numbers

use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

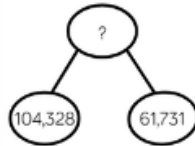
solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Mental Calculation Strategies



- add multiples of 10s, 100s, 1000s, 10000, 1000000 and tenths
- fluency of 2-digit + 2-digit including decimals
- partition second number to add
- use number facts, bridging and place value
- adjust numbers to add
- add near multiples
- partition and recombine
- using known facts

Part-Whole Model



Bar Model



Column Method

1	0	4	3	2	8
+	6	1	7	5	1
1	6	6	0	5	9

1

$$\begin{array}{r} 3.65 \\ + 2.41 \\ \hline 6.06 \\ 1 \end{array}$$

Preferred Method



ADDITION

Year Six

National Curriculum Objectives

- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Mental Calculation Strategies

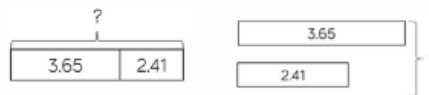


- add multiples of 10s, 100s, 1000s, 10000, 1000000, tenths and hundredths
- fluency of 2-digit + 2-digit including decimals
- partition second number to add
- use number facts, bridging and place value
- adjust numbers to add
- add near multiples
- partition and recombine
- using known facts

Part-Whole Model



Bar Model

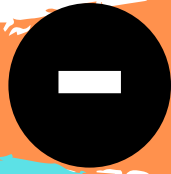


Column Method

1	0	4	3	2	8
+	6	1	7	5	1
1	6	6	0	5	9
				1	

$$\begin{array}{r} 3.65 \\ + 2.41 \\ \hline 6.06 \\ 1 \end{array}$$

Preferred Method



SUBTRACTION

Year One

National Curriculum Objectives

read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs

represent and use number bonds and related subtraction facts within 20

add and subtract one-digit and two-digit numbers to 20, including 0

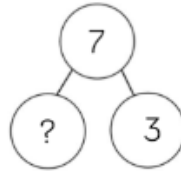
solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$

Mental Calculation Strategies

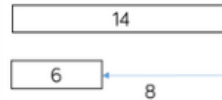
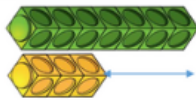


- 1 less/fewer
- 2 less/fewer
- 10 less
- you subtract from the whole
- halves up to 20
- difference between
- using number bonds

Part-Whole Model



Bar Model



Number Lines





SUBTRACTION

Year Two

National Curriculum Objectives

solve problems with addition and subtraction:

- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods

recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- a two-digit number and 1s
- a two-digit number and 10s
- 2 two-digit numbers
- adding 3 one-digit numbers

show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot

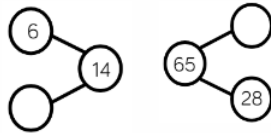
recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems



Mental Calculation Strategies

- 10 less
- subtract 1 digit from 2 digit by bridging
- partition second number, count back in 10's and 1s
- subtract 10 and multiples of 10
- halves up to 100 (multiples of 10)
- difference between
- subtract near multiples of 10, 11, 19, 21 and 29

Part-Whole Model



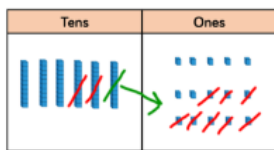
Bar Model



Number Lines



Base 10/Dienes



Column Method

T	U		
	:		5 1 65
	-		-28
	.		37
1	1		

Preferred Method



SUBTRACTION

Year Three

National Curriculum Objectives

add and subtract numbers mentally, including:

- a three-digit number and 1s
- a three-digit number and 10s
- a three-digit number and 100s

add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction

estimate the answer to a calculation and use inverse operations to check answers

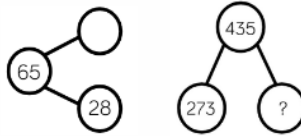
solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Mental Calculation Strategies

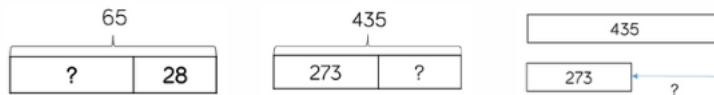


- subtract multiples of 10, 100
- subtract single digit bridging through boundaries
- partition second number to subtract
- subtract near multiples of 10 and 100 by rounding and adjusting
- difference between
- subtract multiples of 10 and 100

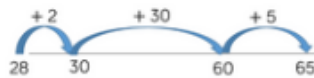
Part-Whole Model



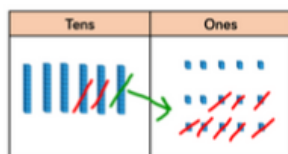
Bar Model



Number Lines



Base 10/Dienes



Column Method

$$\begin{array}{r} 5 \quad 1 \\ 65 \\ - 28 \\ \hline 37 \end{array} \qquad \begin{array}{r} 3 \quad 1 \\ 435 \\ - 273 \\ \hline 162 \end{array}$$

Preferred Method



SUBTRACTION

Year Four

National Curriculum Objectives

add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate

estimate and use inverse operations to check answers to a calculation

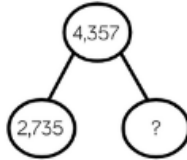
solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Mental Calculation Strategies



- subtract multiples of 10s, 100s and 1000s
- fluency of 2-digit - 2-digit
- partition second number to subtract decimal pairs of 10 and 1
- subtract near multiples by rounding and adjusting
- difference between

Part-Whole Model



Bar Model



Base 10/Dienes

Thousands	Hundreds	Tens	Ones

Column Method

$$\begin{array}{r}
 \overset{3}{4} \overset{1}{3} 57 \\
 - 2735 \\
 \hline
 1622
 \end{array}$$

Preferred Method



SUBTRACTION

Year Five

National Curriculum Objectives

add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

add and subtract numbers mentally with increasingly large numbers

use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

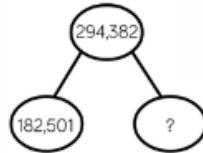
solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Mental Calculation Strategies



- subtract multiples of 10s, 100s, 1000s, 10000, 1000000 and tenths
- fluency of 2-digit - 2-digit including decimals
- partition second number to subtract
- use number facts, bridging and place value
- adjust numbers to subtract
- subtract near multiples
- using known facts

Part-Whole Model



Bar Model



Column Method

	2	9	3	¹ 3	8	2
-	1	8	2	5	0	1
	1	1	1	8	8	1

$$\begin{array}{r} 4 \quad 1 \\ 5.43 \\ - 2.7 \\ \hline 2.73 \end{array}$$

Preferred Method



SUBTRACTION

Year Six

National Curriculum Objectives

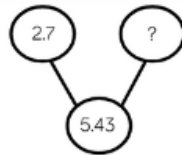
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Mental Calculation Strategies



- subtract multiples of 10s, 100s, 1000s, 10000, 1000000, tenths and hundredths
- fluency of 2-digit - 2-digit including decimals
- partition second number to subtract
- use number facts, bridging and place value
- adjust numbers to subtract
- subtract near multiples
- using known facts

Part-Whole Model



Bar Model



Column Method

	2	9	3	1	3	8	2
-	1	8	2	5	0	1	
	1	1	1	8	8	1	

$$\begin{array}{r} 4 \ 1 \\ 5.43 \\ - 2.7 \\ \hline 2.73 \end{array}$$

Preferred Method

Multiplication and Division Progression

Year One

solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

Year Two

recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs

show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot

solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

Year Three

recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Year Four

recall multiplication and division facts for multiplication tables up to 12×12

use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers

recognise and use factor pairs and commutativity in mental calculations

multiply two-digit and three-digit numbers by a one-digit number using formal written layout

solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

Year Five

identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers

know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers

establish whether a number up to 100 is prime and recall prime numbers up to 19

multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers

multiply and divide numbers mentally, drawing upon known facts

divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000

recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)

solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Year Six

multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

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

perform mental calculations, including with mixed operations and large numbers

identify common factors, common multiples and prime numbers

use their knowledge of the order of operations to carry out calculations involving the 4 operations



MULTIPLICATION

Years One and Two

National Curriculum Objectives

Year One

solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

Year Two

recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs

show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot

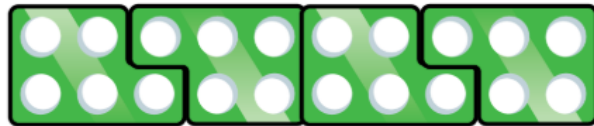
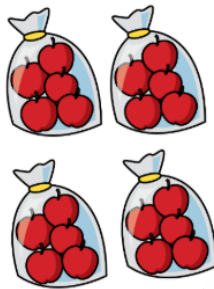
solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

Mental Calculation Strategies

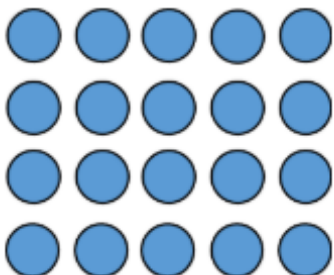
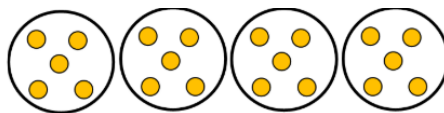
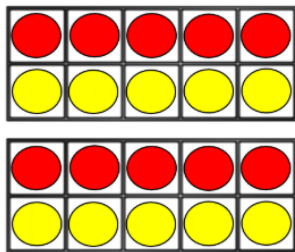


- count in 2s, 10s and 5s
- doubling (using numbers to 10)
- double multiples of 10

- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables
- Show that multiplication of two numbers can be done in any order (commutative)
- recognising odd and even numbers



One bag holds 5 apples.
How many apples do 4 bags hold?



$$5 + 5 + 5 + 5 = 20$$

$$4 \times 5 = 20$$

$$5 \times 4 = 20$$



MULTIPLICATION

Years Three and Four

National Curriculum Objectives

Year Three

recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Year Four

recall multiplication and division facts for multiplication tables up to 12×12

use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers

recognise and use factor pairs and commutativity in mental calculations

multiply two-digit and three-digit numbers by a one-digit number using formal written layout

solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects



Mental Calculation Strategies

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- doubling
- halving

- recall and use multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including by 0 and 1; dividing by 1
- recognise and use factor pairs and commutativity in mental calculations
- multiply together three one-digit numbers, making choices about which order to do them in
- doubles and near doubles

	H	T	O	
		3	4	
x			5	
	1	7	0	
	1	2		

	H	T	O		
		3	4		
x			5		
		2	0	(5 x 4)	
+	1	5	0	(5 x 30)	
	1	7	0		

	H	T	O	
	2	4	5	
x			4	
	9	8	0	
	1	2		



MULTIPLICATION

Years Five and Six

National Curriculum Objectives

Year Five

- identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally, drawing upon known facts
- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000
- recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
- solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Year Six

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- 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
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations



Mental Calculation Strategies

- identify multiples using known number facts
- multiply numbers mentally drawing upon known facts
- multiply whole numbers and those involving decimals by 10, 100 and 1000 using place value knowledge
- doubling and near doubling
- multiply numbers mentally drawing upon known facts
- doubling and near doubling

	Th	H	T	O
	1	8	2	6
x				3
	5	4	7	8
	2		1	

	H	T	O
		2	2
x		3	1
		2	2
	6	6	0
	6	8	2

	Th	H	T	O	
		2	3	4	
x			3	2	
		4	6	8	
1	7	1	0	2	0
	7	4	8	8	

	TTh	Th	H	T	O
		2	7	3	9
x				2	8
	2	1	9	1	2
2	5	3	7		
	5	4	7	8	0
1		1			
	7	6	6	9	2



DIVISION

Years One and Two

National Curriculum Objectives

Year One

solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

Year Two

recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs

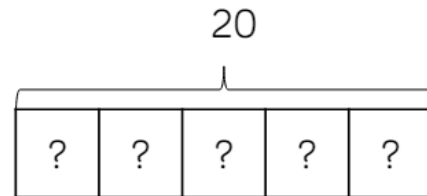
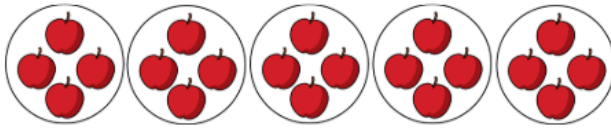
show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot

solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

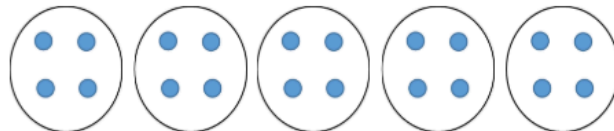
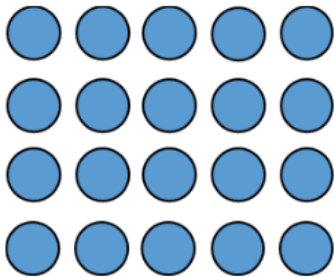
Mental Calculation Strategies



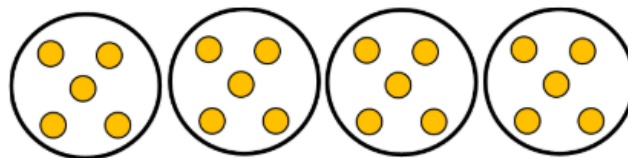
- sharing equally
- halving equally
- counting in 2s, 5s and 10s
- use counting for grouping
- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables
- use multiplication fact for grouping
- recognise odd and even numbers
- half of any even number up to 100



There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?



$$20 \div 5 = 4$$





DIVISION

Years Three and Four

National Curriculum Objectives

Year Three

recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Year Four

recall multiplication and division facts for multiplication tables up to 12×12

use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers

recognise and use factor pairs and commutativity in mental calculations

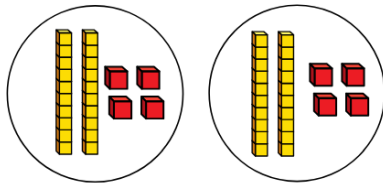
multiply two-digit and three-digit numbers by a one-digit number using formal written layout

solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects



Mental Calculation Strategies

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- halving equally
- recall half of any even number up to 100
- recall half of any multiple of 10
- recall and use multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including by 0 and 1; dividing by 1
- recognise and use factor pairs and commutativity in mental calculations
- strategies for finding simple unit fractions of a number



52

52			
?	?	?	?

53

53				
13	13	13	13	1

		1	3	
	4	5	12	



DIVISION

Years Five and Six

National Curriculum Objectives

Year Five

- identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally, drawing upon known facts
- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000
- recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
- solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Year Six

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- 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
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations



Mental Calculation Strategies

- recall and use multiplication and division facts for multiplication tables up to 12 x 12
- use place value, known and derived facts to multiply and divide mentally, including by 0 and 1; dividing by 1
- recognise and use factor pairs and commutativity in mental calculations
- strategies for finding simple unit fractions of a number
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- divide numbers mentally drawing upon known facts
- use knowledge of factors and multiples to determine whether a number will have a remainder

		1	3	
4	5	1	2	

		2	1	4
4	8	5	1	6

		4	2	6	6	
2	8	5	1	3	1	2

		0	3	6	
12	4	4	3	7	2

			2	4	r	1	2
1	5	3	7	2			
-		3	0	0			
			7	2			
-			6	0			
			1	2			

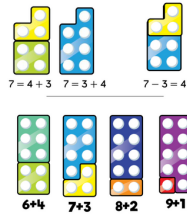
- $1 \times 15 = 15$
- $2 \times 15 = 30$
- $3 \times 15 = 45$
- $4 \times 15 = 60$
- $5 \times 15 = 75$
- $10 \times 15 = 150$

Alternative Methods

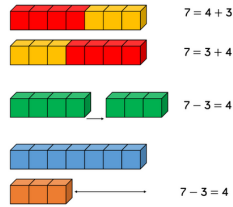
Whilst we aim to ensure that all students are confident using one robust method of calculation, there may be times when students need to approach the calculation using a different perspective and teachers may need to introduce the following methods to reinforce understanding.



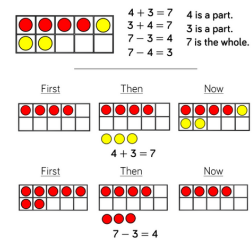
Number Shapes



Cubes



Ten Frames



MULTIPLICATION

Partitioning

×	20	2
30	600	60
1	20	2

×	200	30	4
30	6,000	900	120
2	400	60	8

DIVISION

Chunking

	0	4	8	9	
15	7	3	3	5	
-	6	0	0	0	(x400)
	1	3	3	5	
-	1	2	0	0	(x80)
		1	3	5	
-		1	3	5	(x9)
				0	

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150