



ST. DUNSTAN'S

St Dunstan's Catholic Primary School

Calculation Policy

A guide for teachers and parents



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What is this policy for?

At St Dunstan's we teach the four main calculation strategies in mathematics in line the National Curriculum. These include addition, subtraction, division and multiplication.

As you will see the children always start with the concrete representation, using a wide range of resources to visually and practically build their understanding. Once secure they are able to move onto the pictorial representations and then finally the abstract. Children will use this approach throughout other mathematics education scaffolding their understanding of number and calculation so that they are able to reason and problem solve with confidence. By teaching the children to reason, children are able to make connections and show a deep understanding of their answer. The children are slowly taken through the stages to enable a deep and fluent understanding.






This policy is designed to help teachers and staff members at St Dunstan's ensure that calculation is taught consistently across the school, and that progression through the year groups is clear.

This policy is designed to help parents, carers and other family members support children's learning by letting them know the expectations for their child's year group and by providing an explanation of the methods used at St Dunstan's.

How do I use this policy?

Each page follows a similar format to help you find the information you need. Addition is paired with subtraction and division with multiplication as these operations are the inverse (opposite) of each other.

These are the objectives from the National Curriculum.

Year 1	
Objectives: <ul style="list-style-type: none"> 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 zero Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = \square - 9$. Pupils memorise and reason with number bonds to 10 and 20 in several forms (for example, $9 + 7 = 16$; $16 - 7 = 9$; $7 = 16 - 9$). They should realise the effect of adding or subtracting zero. This establishes addition and subtraction as related operations. Pupils combine and increase numbers, counting forwards and backwards. They discuss and solve problems in familiar practical contexts, including using quantities. Problems should include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less than, so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly. 	
Addition	Subtraction
<p>Count on using number tracks / number lines / 100 grids to support.</p>  <p>Record related number facts. e.g. $4 + 5 = 9$, $5 + 4 = 9$, $9 = 4 + 5$, $9 = 5 + 4$</p>  <p>Develop understanding of the equals sign / equality and the concept of 'empty box' questions. Record solutions to calculations such as $4 + \square = 9$.</p>  <p>Use practical apparatus e.g. counters, multi-link, objects etc.</p> <p>Vocabulary: Add, plus, and, altogether, more, make, sum, total, how many more to make?</p>	<p>Count back using number tracks / number lines / 100 grids to support the development of the concept of subtraction as take away.</p>  <p>Develop subtraction facts initially to ten and then to 20. Record related number facts (and make links to related addition facts) e.g. $9 - 4 = 5$, $9 - 5 = 4$</p>  <p>Develop understanding of the equals sign / equality and the concept of 'empty box' questions. Record solutions to calculations such as $9 - \square = 5$.</p> <p>Use practical apparatus e.g. counters, multi-link, objects etc.</p> <p>Vocabulary: subtract, take away, minus, leave, less, left over, how many are left? How many are gone? Find the difference.</p>

This is some of the vocabulary that will be used in lessons and that the children are expected to know.

These examples show you the types of work and methods that children will be using in class.

Early Years Foundation Stage

Objective (Early Learning Goal)

Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer.

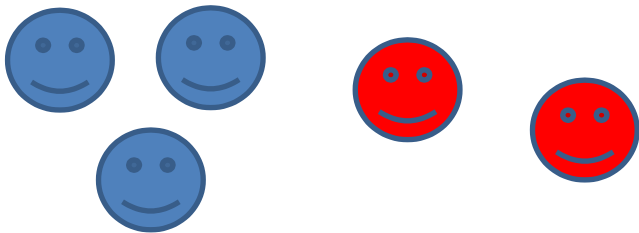
What adults could do:

Use mathematical vocabulary and demonstrate methods of recording, using standard notation where appropriate.
Encourage children to make up their own story problems for other children to solve.

Addition

Subtraction

Finds the total number of items in two groups by counting all of them
 $3 + 2$



Subtraction as take away (using objects or drawing and crossing out).
 $6 - 2 =$



Vocabulary: add, plus, and, altogether, one more than, make, sum, total, how many more to make?

Vocabulary: Subtract, take away, minus, leave, one less than, left over, how many are left, how many are gone, Fewer

Early Years Foundation Stage

Objectives (Early Learning Goal)

Solve problems, including doubling, halving and sharing.

What adults can do:

Use mathematical vocabulary and demonstrate methods of recording, using standard notation where appropriate.

Talk about the methods children use to answer a problem they have posed, e.g. 'Get one more, and then we will both have two.'

Encourage children to extend problems, e.g. "Suppose there were three people to share the bricks between instead of two."

Multiplication

Practical ways of doubling

Find that many again.

I have 3 apples, can you double the number of apples?

There are 6 apples in total.



Division

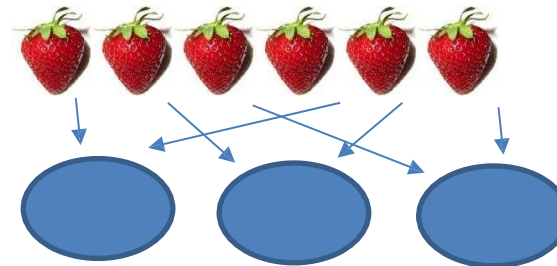
Practical ways of halving

Give half of these pencils to the next table.



Practical ways of sharing

Share these strawberries between 3 children– how many will they have each?



Each child will get 3 strawberries

Vocabulary: Doubles, groups.

Vocabulary: Sharing, into groups, , halve, share, one each... two each... three each etc.

Year 1

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 zero.

Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = \square - 9$.

Pupils memorise and reason with number bonds to 10 and 20 in several forms (for example, $9 + 7 = 16$; $16 - 7 = 9$; $7 = 16 - 9$). They should realise the effect of adding or subtracting zero. This establishes addition and subtraction as related operations.

Pupils combine and increase numbers, counting forwards and backwards.

They discuss and solve problems in familiar practical contexts, including using quantities. Problems should include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less than, so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.

Addition

Subtraction

Count on using number tracks / number lines / 100 grids to support.



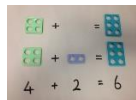
Record related number facts.

e.g. $4 + 5 = 9$, $5 + 4 = 9$, $9 = 4 + 5$, $9 = 5 + 4$



Develop understanding of the equals sign / equality and the concept of 'empty box' questions.

Record solutions to calculations such as $4 + \square = 9$.



Use practical apparatus e.g. counters, multilink, objects etc.

Vocabulary: Add, plus, and, altogether, one more, make, sum, total, how many more to make?

Count back using number tracks / number lines / 100 grids to support the development of the concept of subtraction as take away.



Develop subtraction facts initially to ten and then to 20.

Record related number facts (and make links to related addition facts)

e.g. $9 - 4 = 5$, $9 - 5 = 4$



Develop understanding of the equals sign / equality and the concept of 'empty box' questions.

Record solutions to calculations such as $9 - \square = 5$.

Use practical apparatus e.g. counters, multilink, objects etc.

Vocabulary: subtract, take away, minus, leave, one less, left over, how many are left? How many are gone? Find the difference.

Year 1

Objectives:

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.
 Through grouping and sharing small quantities, pupils begin to understand: multiplication and division; doubling numbers and quantities; and finding simple fractions of objects, numbers and quantities.
 They make connections between arrays, number patterns, and counting in twos, fives and tens.

Multiplication

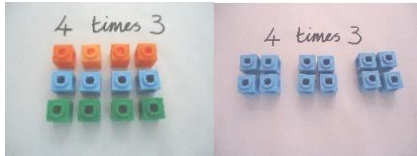
Division

x2, x5, x10 – Practical methods

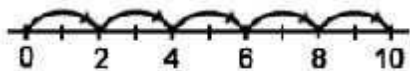
Counting aloud in jumps of the above amounts

- 0, 2, 4, 6, 8, 10, 12, 14...
- 0, 5, 10, 15, 20, 25...
- 0, 10, 20, 30, 40, 50...

Repeated addition



Number line



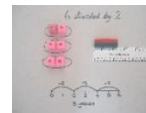
$5 \times 2 = 10$

Vocabulary: Lots of, groups, repeat, same size.

Develop division as sharing



Develop division as repeated grouping (repeated subtraction of sets of the same size) using practical apparatus and diagrams.



How many sets of two stars could you make with ten stars?



5 sets.
 10 stars give five sets of two stars.

Vocabulary: Sharing into groups, fairly, equal, halve, share, one each...two each...three each... etc.

Year 2

Objectives:

Solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measure 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 ones; a two-digit number and tens; two two-digit numbers; adding three one-digit numbers.
 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 and use this to check calculations and solve missing number problems.
 Pupils extend their understanding of the language of addition and subtraction to include sum and difference.
 Pupils practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using $3 + 7 = 10$; $10 - 7 = 3$ and $7 = 10 - 3$ to calculate $30 + 70 = 100$; $100 - 70 = 30$ and $70 = 100 - 30$. They check their calculations, including by adding to check subtraction and adding numbers in a different order to check addition (for example, $5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5$). This establishes commutativity and associativity of addition.
 Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers.

Addition

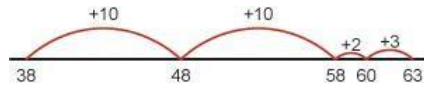
Subtraction

Continue to use practical apparatus e.g. counter, blocks, objects etc.

Develop understanding of partitioning and place value and use this to support addition.

TU + U	TU + TU	HTU + TU
41+ 8	42+33	
40 + 1 + 8	40 + 30 (collect the 'tens' together)	
40 + 9= 49	2+3 (collect the 'units' together)	
	70 + 5 = 75 (add the totals together)	

Practical apparatus is used to support this, as are number tracks /100 squares and number lines (numbered and empty). Record the outcomes of calculations in horizontal format.



When confident with concepts of partitioning and place value, horizontal recording can be replaced with recording in columns with a focus on place value.

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 1 \\ + \quad 8 \\ \hline 4 \quad 9 \end{array}$$

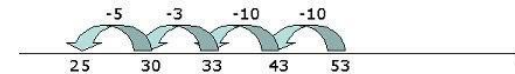
Continue to use practical apparatus e.g. counter, blocks, objects etc.

Develop understanding of partitioning and place value and use this to support subtraction.

TU - U	TU - TU	HTU - TU	
41-8	33-12		If the units are larger than the amount being subtracted start from 33
40-1-7	30-10=20 (subtract the 'tens')		subtract the ten 33-10=23
40-8=33	3-2=1 (subtract the 'units')		subtract the unit 23-7=16
	20+1=21 (add the two totals together)		
	33-12=21		

Practical apparatus are used to support this, as are number tracks /100 squares and number lines (numbered and empty).

Record the outcomes of calculations in horizontal format.



$$41 - 8 = 33$$

When confident with concepts of partitioning and place value, horizontal recording can be replaced with recording in columns with a focus on place value.

When using column subtraction, children are not expected to be borrowing / exchanging in Year 2

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 8 \\ - \quad 7 \\ \hline \end{array}$$

Vocabulary: Add, addition, plus, and, altogether, more, make, sum, total, increase, number line, count on, partition, inverse.

Vocabulary: subtract, subtraction, take away, minus, leave, less, left over, how many are left? How many are gone? Inverse, decrease, difference, fewer than. **Borrowing should not be used as a term because it implies that the borrowed number needs to go back. It is included here as it used to be a common term.**

Year 2

Objectives:

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 two numbers can be done in any order (commutative) and division of one 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.
 Pupils use a variety of language to describe multiplication and division.
 Pupils are introduced to the multiplication tables. They practise to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other.
 They connect the 10 multiplication table to place value, and the 5 multiplication table to the divisions on the clock face.
 They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations.
 Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition.
 They begin to relate these to fractions and measures (for example, $40 \div 2 = 20$, 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example, $4 \times 5 = 20$ and $20 \div 5 = 4$).


Multiplication


Division

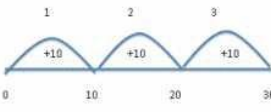
Develop an understanding of multiplication using arrays and number lines showing repeated groups.

4×5 ooooo ooooo ooooo ooooo 4 rows of 5	5×4 oooo oooo oooo oooo 5 rows of 4
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Use number lines to show repeated grouping (repeated addition of sets of the same







3 x 10 (3 jumps of 10)

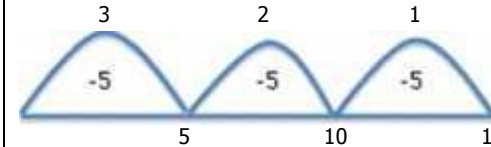
Vocabulary: Lots of groups, repeat, same size, times, multiply, jumps of, steps of, multiplied by, multiple of, array, row, column, double, repeated addition.

Develop an understanding of division using arrays and number lines showing repeated groups

Use number lines to show repeated grouping (repeated subtraction of sets of the same size)



Division as repeated subtraction using a number line.



Start at 15. Jump back in fives until zero is reached.
 Count the number of jumps.
 $15 \div 5 = 3$

Questions that give rise to remainders.
 Use the 'array' format above.
 $17 \div 5 =$
 OOOO 1 Three groups of 5
 OOOO 2 2 left over (remainder)
 OOOO 3 $17 \div 5 = 3$ remainder 2
 OO

Vocabulary: sharing, share equally, into groups, fairly, equal, halve, share, one each...two each...three each... etc., divided by, divided into, left over, remainder, how many groups?

Year 3

Objectives:

Add and subtract numbers mentally, including ; a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds.

Add and subtract numbers with up to three 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.

Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.

Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent

Addition

Subtraction

Continue to develop understanding of partitioning and place value and use this to support addition.

Use practical apparatus to support this, as are number tracks /100 squares and number lines.

Where units combine to make totals greater than 10, regroup using partitioning skills

$$25 + 36$$

$$20 + 30 = 50$$

$$5 + 6 = 11$$

$$50 + 11 = 50 + 10 + 1 = 61$$



Pupils continue to determine when calculations are best carried out using mental strategies.

Record in columns with a focus on place value. Use expanded recording and apparatus to illustrate concept initially if required before moving towards the formal written method.

TU + TU HTU+TU HTU+HTU

$\begin{array}{r} \text{T} \quad \text{U} \\ 2 \quad 5 \\ + 3 \quad 6 \\ \hline 6 \quad 1 \\ 1 \end{array}$	$\begin{array}{r} \text{H} \quad \text{T} \quad \text{U} \\ 5 \quad 6 \quad 7 \\ + 5 \quad 4 \\ \hline 6 \quad 2 \quad 1 \\ 1 \quad 1 \end{array}$
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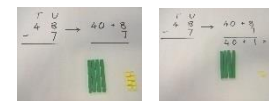
Continue to develop understanding of partitioning and place value and use this to support subtraction.

Use practical apparatus to support this, as are number tracks /100 squares and number lines.

Use expanded recording and apparatus to illustrate concept initially if required before moving towards the formal written method.

No exchange

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 8 \\ - \quad 7 \\ \hline \end{array} \longrightarrow \begin{array}{r} 40 + 8 \\ - \quad 7 \\ \hline 40 + 1 = 41 \end{array}$$

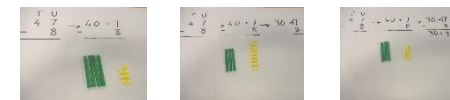


becomes

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 8 \\ - \quad 7 \\ \hline 4 \quad 1 \end{array}$$

Exchange / Borrowing

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 7 \\ - \quad 8 \\ \hline \end{array} \longrightarrow \begin{array}{r} 40 + 7 \\ - \quad 8 \\ \hline \end{array} \longrightarrow \begin{array}{r} 30 + 17 \\ - \quad 8 \\ \hline 30 + 9 = 39 \end{array}$$



becomes

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 7 \\ - \quad 8 \\ \hline 4 \quad 1 \end{array} \longrightarrow \begin{array}{r} 3 \quad 17 \\ - \quad 8 \\ \hline 3 \quad 9 \end{array}$$

Vocabulary: Add, addition, plus, and, altogether, more, make, sum, total, increase, number line, count on, partition, inverse, how many more to make? How many more is ___ than ___? Hundreds, tens, units.

Vocabulary: subtract, subtraction, take away, minus, decrease, leave, less, left over, how many are left/left over? How many are gone? Inverse, decrease, difference, fewer than, more than, hundreds, tens, units, boundary, how much less is ___ than ___?

Borrowing should not be used as a term because it implies that the borrowed number needs to go back. It is included here as it used to be a common term.

Year 3

Objectives:

Recall and use multiplication and division facts for the 2,3, 4, 5, 8 and 10 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 objects.
 Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency.
 Through doubling, they connect the 2, 4 and 8 multiplication tables.
 Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and multiplication and division facts (for example, using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts (for example, $30 \times 2 = 60$, $60 \div 3 = 20$ and $20 = 60 \div 3$).
 Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division.
 Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

Multiplication

Division

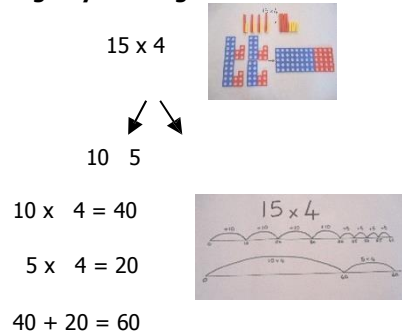
Develop the use of x and = symbols to record calculations horizontally.

Use arrays and other practical apparatus to illustrate commutativity (that multiplication calculations can be carried out in any order) e.g. 2 x 5 arrives at the same product as 5 x 2.
 Begin to derive new facts from known facts
 e.g. $3 \times 2 = 6$ (known fact)
 $30 \times 2 = 60$
 $300 \times 2 = 600$ etc.



Begin to use understanding of place value and partitioning to carry out multiplication of two-digit by one-digit numbers

15 x 4



10 5

10 x 4 = 40

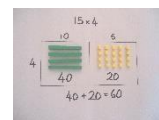
5 x 4 = 20

40 + 20 = 60

Begin to use grid approaches to illustrate as appropriate using practical apparatus to support.

10 5

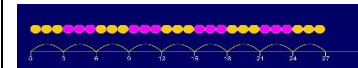
40	20
4	



40 + 20 = 60

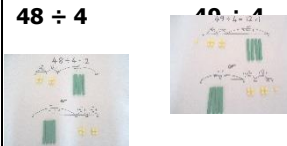
Develop the use of ÷ and = symbols to record calculations horizontally

Use arrays and other practical apparatus to illustrate making of repeated groups
 Begin to derive new facts from known facts
 e.g. $6 \div 2 = 3$ (known fact)
 $60 \div 2 = 30$
 $600 \div 2 = 300$
Begin to carry out division of two-digit by one-digit numbers, first without remainders, then introducing remainders, illustrating this using informal methods first if required.
 $27 \div 3$



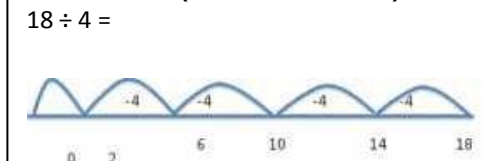
Division using larger multiples of the divisor, first with no remainders, then with remainders

$48 \div 4$



12 + 12 = 24

Numberline (with remainders)



Four jumps of 4 with 2 left over
 $18 \div 4 = 4$ remainder 2

Vocabulary: lots of, groups, repeat, same size, times, multiply, jumps of, steps of, multiplied by, multiple of, array, row, column, double, repeated addition, product, grid method.

Vocabulary: sharing, equally, into groups, fairly, equal, halve, share, one each...two each...three each... etc. divided by, divided onto, left over, remainder, how many groups?

Year 4

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.
 Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.

Addition

Subtraction

Expanded column method (units first)

215 + 133

$$\begin{array}{r} 215 \\ + 133 \\ \hline 8 \text{ (5 + 3 = 8)} \\ 40 \text{ (10 + 30 = 40)} \\ \underline{300} \text{ (200 + 100 = 300)} \\ 348 \end{array}$$

Compact column

215 + 133

OR

226 + 193

$$\begin{array}{r} 215 \\ + 133 \\ \hline 348 \end{array}$$

$$\begin{array}{r} 226 \\ + 193 \\ \hline 419 \\ 1 \end{array}$$

Ensure that on the middle column, children are taught to say '20 + 90' as opposed to '2 + 9' and for the hundreds column '200 + 100' instead of '2 + 1'.

Expanded partitioning with borrowing

193 - 66

$$\begin{array}{r} 193 = 100 + 90 + 3 \\ - 66 = 60 + 6 \\ \hline 127 = 100 + 20 + 7 \end{array}$$

Compact column

193 - 66

$$\begin{array}{r} 193 \\ - 66 \\ \hline 127 \end{array}$$

Vocabulary: add, addition, plus, make, more, sum, total, increase, inverse, altogether, how many more to make? How many more is ___ than ___? Number line, partition, hundreds, tens, units, count on.

Vocabulary: subtract, subtraction take away, minus, decrease, leave, how many are left/left over? More than, fewer than, difference, tens/hundreds boundary, how much more/less is ___, inverse.

Objectives:

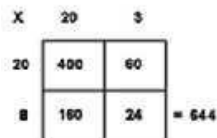
- Recall multiplication and division facts for multiplication tables up to 12×12 .
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.
- Recognise and use factor pairs and commutativity in mental 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 one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.
- Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency.
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example $600 \div 3 = 200$ can be derived from $2 \times 3 = 6$).
- Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers (see Mathematics Appendix 1).
- Pupils write statements about the equality of expressions (for example, use the distributive law $39 \times 7 = 30 \times 7 + 9 \times 7$ and associative law $(2 \times 3) \times 4 = 2 \times (3 \times 4)$).
- They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, $2 \times 6 \times 5 = 10 \times 6 = 60$.
- Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.

Multiplication

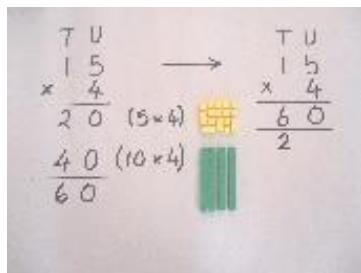
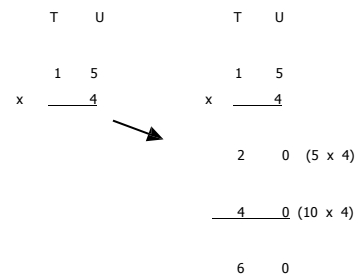
Using the Grid Method for TU x TU

23×28

$400 + 60 = 460$
 $160 + 24 = 184$
 $460 + 184 = 644$



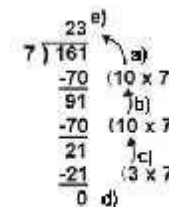
Develop expanded recording in columns and then move to formal written method, using practical apparatus to support as required.



Division

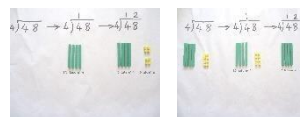
Moving into more formal vertical method

$161 \div 7 =$

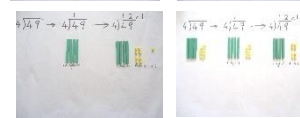


Move to develop the standard method for short division, first with no remainders, then with remainders

$48 \div 4$



$49 \div 4$



Children will generally be moved on to the formal method of short division as soon as they are able. The other methods illustrated may be used as teaching tools to help children understand the basic concept.

Practical equipment may be used to introduce how short division works.

Vocabulary: lots of, groups, repeat, same size, times, multiply, jumps of, steps of, multiplied by, multiple of, array, row, column, double, repeated addition, product, grid method, short multiplication.

Vocabulary: sharing, share equally, into groups, fairly, equal, halve, share, divided by, divided into, left over, remainder, how many groups, factor, divisible by, chunking, inverse, quotient.

Years 5 & 6

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.
 Pupils practise using the formal written methods of columnar addition and subtraction with increasingly large numbers to aid fluency
 They practise mental calculations with increasingly large numbers to aid fluency (for example, $12\,462 - 2300 = 10\,162$).
In the KS2 tests at the end of Year 6, children are expected to use the formal methods for addition and subtraction.

Addition

Subtraction

Add larger numbers (including hundreds and thousands) or decimal amounts using partitioning and place value to support this.

$$\begin{aligned} 2.9 + 1.7 \\ 2 + 1 = 3 \\ 0.9 + 0.7 = 1.6 \\ 3 + 1.6 = 4.6 \end{aligned}$$

Formal (compact column)

$$\begin{array}{r} 2763 + 1438 \\ 2763 \\ + 1438 \\ \hline 4201 \\ 111 \end{array}$$

Extend to numbers with any number of digits and decimals with 1 and 2 decimal places.

e.g. $124.9 + 117.25 = 242.15$ (can use a number line also to support if necessary)

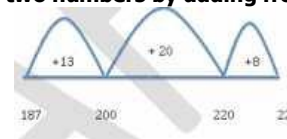
$$\begin{array}{r} 124.9 \\ + 117.25 \\ \hline 242.15 \\ 11 \end{array}$$

Revert to expanded methods if the children experience any difficulty.

Vocabulary: add, addition, plus, make, more, sum, total, increase, inverse, altogether, how many more to make ___? How many more is ___ than ___? Number line, partition, hundreds, tens, units, count on.

Find the difference between the two numbers by adding from 187 to 228 (working left to right).

$$\begin{aligned} 187 + 13 = 200 \quad 200 + 20 = 220 \\ 13 + 20 + 8 = 41 \end{aligned}$$



Number line should always be used in favour of formal vertical methods when subtracting between close amounts e.g. $2008 - 1996$. You just need to jump from 1996 to 2000 (+4), then 2000 to 2008 (+8). $4 + 8 = 12$, therefore $2008 - 1996 = 12$.

Formal

$$\begin{array}{r} 228 \\ - 187 \\ \hline 041 \end{array}$$

Answer: **41**

Start with the units
 Then the tens

$$\begin{aligned} 8 - 7 = 1 \\ 2(20) - 8(80). \text{ Take one group of hundred from 2(200).} \\ 120 - 80 = 40. \end{aligned}$$

Finally, the hundreds column $1(100) - 1(100) = 0$
 Leaving an answer of 41.

Vocabulary: subtract, subtraction take away, minus, decrease, leave, how many are left/left over? More than, fewer than, difference, tens/hundreds boundary, how much more/less is ___?

Year 5

Objectives:

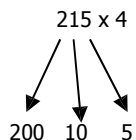
Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers.
 Pupils write statements about the equality of expressions (for example, use the distributive law $39 \times 7 = 30 \times 7 + 9 \times 7$ and associative law $(2 \times 3) \times 4 = 2 \times (3 \times 4)$).
 They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, $2 \times 6 \times 5 = 10 \times 6 = 60$.
 Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.
 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.
 Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign.
 Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.
 Pupils practise and extend their use of the formal written methods of short multiplication and short division. They apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.
 They use and understand the terms factor, multiple and prime, square and cube numbers.
 Pupils interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (for example, $98 \div 4 = 49 \text{ r } 2 = 24 \frac{1}{2} = 24.5 \approx 25$).
 Pupils use multiplication and division as inverses to support the introduction of ratio in year 6, for example, by multiplying and dividing by powers of 10 in scale drawings or by multiplying and dividing by powers of a 1000 in converting between units such as kilometres and metres.
 Distributivity can be expressed as $a(b + c) = ab + ac$.
 They understand the terms factor, multiple and prime, square and cube numbers and use them to construct equivalence statements (for example, $4 \times 35 = 2 \times 2 \times 35$; $3 \times 270 = 3 \times 3 \times 9 \times 10 = 92 \times 10$).
 Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example, $13 + 24 = 12 + 25$; $33 = 5 \times \dots$).

Multiplication

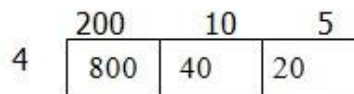
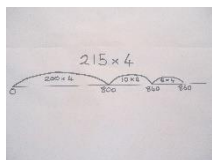
Division

Extend written approaches to HTU x U, then to ThHTU x U

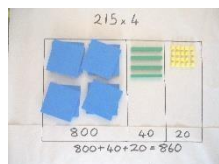
Illustrate using partitioning approaches or grid approaches as required



$$\begin{aligned} 200 \times 4 &= 800 \\ 10 \times 4 &= 40 \\ 5 \times 4 &= 20 \\ 800 + 40 + 20 &= 860 \end{aligned}$$



$$800 + 40 + 20 = 860$$



Extend written calculation methods to more complex problems involving larger numbers, firstly with no remainders.

No carrying forward required
 Example: $448 \div 4$ (as in Year 4, but with additional hundreds column)

No carrying forward required, but with remainders
 $449 \div 4$ (as in year 4, but with additional hundreds column)

Carrying forward required
 $536 \div 4$

Carrying forward required, but with remainders
 $539 \div 4$

Children will generally be moved on to the formal method of short division as soon as they are able. The other methods illustrated may be used as teaching tools to help children understand the basic concept.

Practical equipment may be used to introduce how short division works.

Year 5

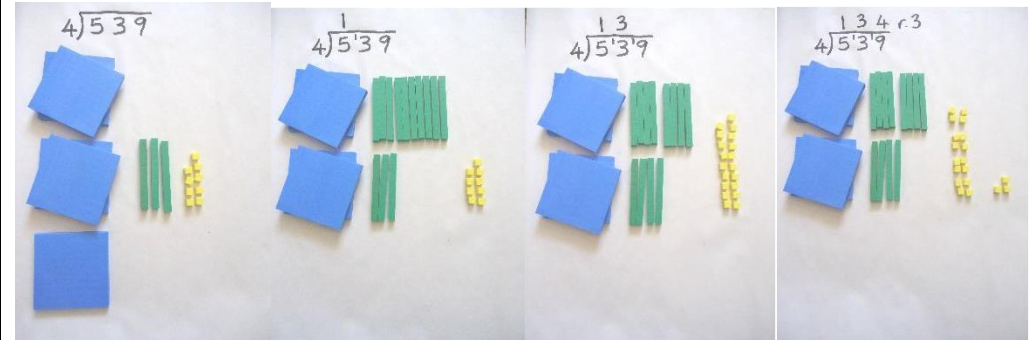
Multiplication (part 2)

Division (part 2)

Develop expanded recording in columns and then move to formal written method, using practical apparatus to support as required.

Practical equipment may also be used to help children understand the process of division.

H T U		H T U
$\begin{array}{r} 115 \\ \times 4 \\ \hline 200 \\ 400 \\ \hline 800 \end{array}$	→	$\begin{array}{r} 215 \\ \times 4 \\ \hline 860 \end{array}$
<p>2 0 (5 x 4)</p> <p>4 0 (10 x 4)</p> <p>8 0 0 (200 x 4)</p>		<p>2</p>
<p>8 6 0</p>		



Vocabulary: lots of, groups, repeat, same size, times, multiply, jumps of, steps of, multiplied by, multiple of, array, row, column, double, repeated addition, product, grid method, short multiplication.

Vocabulary: Sharing, share equally, into groups, fairly, equal, halve, share, divided by, divided into, left over, remainder, how many groups, factor, divisible by, divisibility, chunking, inverse, quotient.

Year 6

Objectives:

- 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 four operations.
- 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.
- Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division
- They undertake mental calculations with increasingly large numbers and more complex calculations.
- Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.
- Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures.
- Pupils explore the order of operations using brackets; for example, $2 + 1 \times 3 = 5$ and $(2 + 1) \times 3 = 9$.
- Common factors can be related to finding equivalent fractions.

In the KS2 tests at the end of Year 6, children are expected to use the formal methods for multiplication and division.

Multiplication

Division

Extend written approaches to HTU x TU and ThHTU x TU

Illustrate using grid approaches as required

26 x 13

20	6		
10	200	60	
3	60	18	

$200 + 60 + 60 + 18 = 338$

Extend written approaches to the formal method of long division when dividing by two-digit numbers, illustrating this using informal methods first if required.

$\begin{array}{r} 28 \text{ r } 12 \\ \hline 15 \overline{) 432} \\ - 300 \text{ (15x20)} \\ \hline 132 \\ - 120 \text{ (15x8)} \\ \hline 12 \end{array}$	$\begin{array}{r} 28 \text{ r } 12 \\ \hline 15 \overline{) 432} \\ \underline{30} \\ 132 \\ \underline{120} \\ 12 \end{array}$
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Multiplication (part 2)

Develop expanded recording in columns and then move to formal written method of long multiplication, using practical apparatus to support as required.

H	T	U		H	T	U
	2	6	→		2	6
x	<u>1</u>	<u>3</u>		x	<u>1</u>	<u>3</u>
	1	8			7	8
	6	0			1	
	6	0		<u>2</u>	<u>6</u>	<u>0</u>
<u>2</u>	<u>0</u>	<u>0</u>		<u>3</u>	<u>3</u>	<u>8</u>
	3	3		1		
	1					

Vocabulary: lots of, groups, repeat, same size, times, multiply, jumps of, steps of, multiplied by, multiple of, array, row, column, double, repeated addition, product, grid method, short multiplication.

Develop expanded recording in columns and then move to formal method of long multiplication, using practical apparatus to support as required.

H	T	U		H	T	U
	2	2	→		2	2
	6				6	
x	<u>1</u>	<u>3</u>		x	<u>1</u>	<u>3</u>
	1	8			6	7
	6	0			1	
	6	0		<u>2</u>	<u>2</u>	<u>6</u>
	6	0		<u>2</u>	<u>9</u>	<u>3</u>
	2	0				
	2	0				
	<u>2</u>	<u>9</u>				
		<u>3</u>				
		8				
		1				

1 Children will generally be moved onto the formal method of short division as soon as they are able. The other methods illustrated may be used as teaching tools to help children understand the basic concept. Practical equipment may be used to introduce how short division works.

Vocabulary: Sharing, share equally, into groups, fairly, equal, halve, share, divided by, divided into, left over, remainder, how many groups, factor, divisible by, divisibility, chunking, inverse, quotient.

