Calculation Policy

January 2023

Mytchett Primary and Nursery Academy Calculation Policy – January 2023

Introduction

The Mytchett Primary & Nursery Academy Calculation Policy has been written with the staff to support the implementation of the school's Long Term Maths Plan. The LTMP meets the requirements of the current National Curriculum and follows a mastery approach to the teaching of mathematics. The National Curriculum aims to ensure that all children:

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

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

National Curriculum 2014

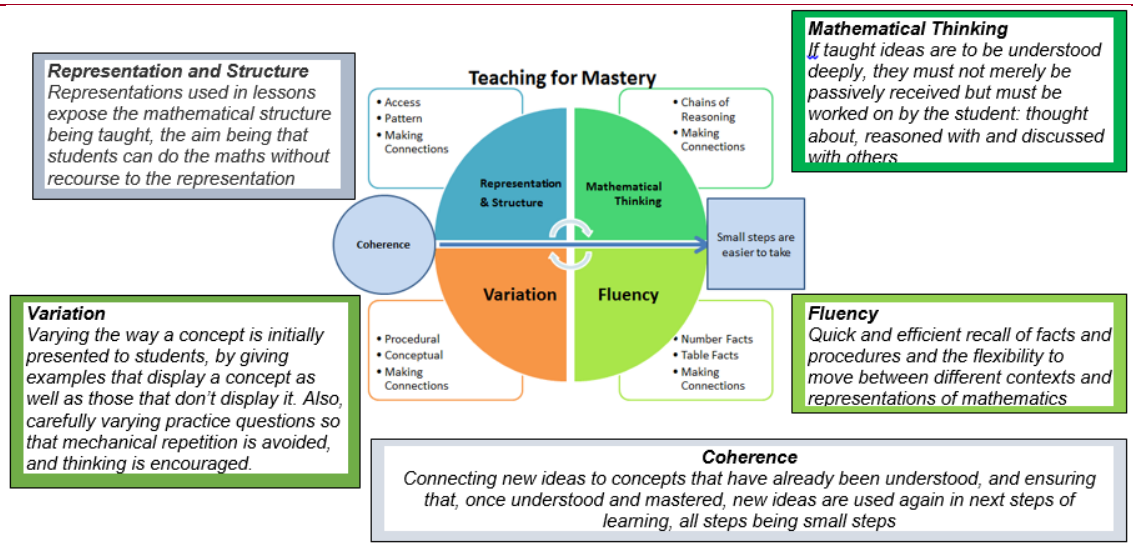
Progression in Calculation

This policy promotes teaching through specific methods and procedures, with particular representations to support children's knowledge and understanding of calculation. It is important that children are given consistency in both procedural and conceptual understanding to support fluency and confidence with mental and written methods. Each of the four operations (addition, subtraction, multiplication and division) builds on mental knowledge and skills which provide the foundation for jottings and informal written methods of recording This policy is a guide in progression for each of the four operations.

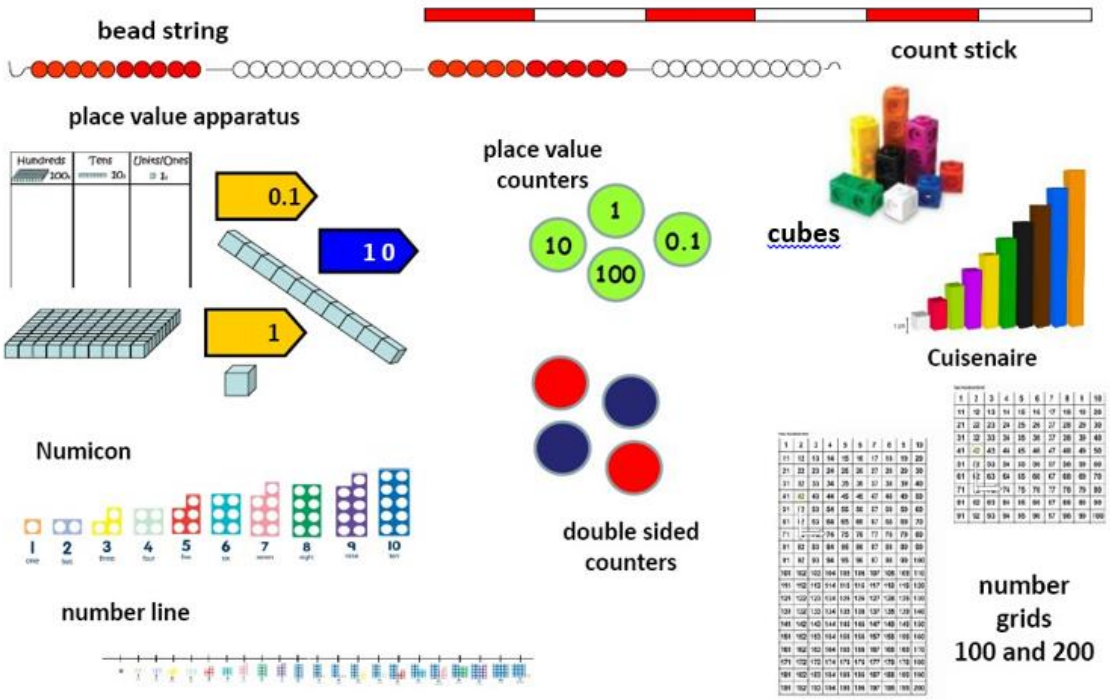
Representation

Consistent use of representation (models and images that support conceptual understanding of mathematics) is key to children's progression in calculations. Children's mathematical understanding is developed through initially introducing **concrete** representations (e.g. Dienes, Numicon) and then **pictorial** (e.g. array) to then enable **abstract** working (e.g. column methods, long multiplication). The progression of representations included in this policy provide a range of models and images that underpin calculating in the relevant year group but it is not exhaustive and applies to both mental and written calculation.

Mastery Maths



Resources to aid calculation in the classroom



Videos to support mathematical teaching and learning

Multiplication **https://www.ncetm.org.uk/resources/40530** KS1 - Multiple Representations of Multiplication KS1- The commutative law for multiplication Lower KS2 - Grid multiplication as an interim step Upper KS2 - Moving from grid to a column	**Algebra** **https://www.ncetm.org.uk/resources/43649** KS1 - Look at 'missing numbers' KS2 - Equations and substitution KS3 - Factorising*	**Number facts** **https://www.ncetm.org.uk/resources/40533** KS1 - Number bonds to ten KS1 - Consolidation and practice (Addition and Subtraction) KS1 - Reinforcing Table Facts KS1 - Rapid recall of multiplication facts	**Division** **https://www.ncetm.org.uk/resources/43589** KS1- Sharing and grouping KS 2 - Place value counters for division KS 3 - Group working on problems*
Number and Place value **https://www.ncetm.org.uk/resources/40534** KS1 - Counting in steps of one and ten KS1 - Partitioning in different ways KS1 - Addition and Subtraction KS1 - Using resources to develop fluency and understanding KS2 - Partitioning (subtraction)	**Fractions** **https://www.ncetm.org.uk/resources/43609** KS1 - Adding fractions and mixed numbers KS2 - Using an array to add fractions KS2 - Bar model dividing by fractions KS3 - Fraction wall to add fractions*	**Subtraction** **https://www.ncetm.org.uk/resources/40532** Lower KS2 – Partitioning Lower KS2 - Discussing Subtraction Strategies Lower KS2 - Developing Column Subtraction Upper KS2- Column Subtraction	**Multiplicative reasoning** **https://www.ncetm.org.uk/resources/43669** KS2 - Bar model for multiplication KS3 - Ratio and proportion* **KS3 videos included for information and use to develop depth for most able pupils if appropriate.*

Addition: Year 1

Mental calculation

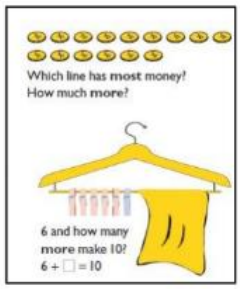
- Read, write and interpret mathematical statements using symbols +, -, =
- Represent and use number bonds and related addition facts within 20
- Add one digit and two-digit numbers up to 20, including zero.
- Solve one-step problems using concrete objects and pictorial representations, and missing number problems such as 7 = - 9
- Given a number, identify (and use the language) one more

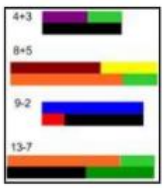
Written calculation

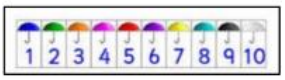
Pupils combine and increase numbers, counting forwards and backwards. They discuss and solve problems in familiar practical contexts, including using quantities. Problems should include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less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

Representations to support calculations

Use a range of concrete and pictorial representations, including:





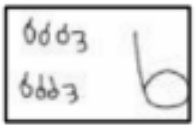


Number lines

Bead strings

Number tracks

Real everyday objects



Key Vocab

put together
add, altogether
total
take away
distance between
difference between
more than and less than
Sum

Links from other strands

- Combine and increase numbers, counting forwards and backwards.
- Develop the concept of addition and subtraction and ... use these operations flexibly.
- Discuss and solve problems in familiar practical contexts, including using quantities
- Compare, describe and solve practical [measure] problems e.g. longer, more than, heavier than
- Problems terminology should include: put together, add, altogether, total, take away, distance between, difference between, more than and less than.

Addition: Year 2

Mental calculation

Add 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**
- **Recall and use addition and subtraction facts to 20 facts fluently, and derive and use related facts up to 100**
- **Demonstrate the commutative law of addition**
- Re-partition numbers eg.
- Use a hundred square
- *Check calculations using inverse and by adding numbers in different order*
- *Using partitioning to separate tens and units, eg,*
54 = 50 + 4

12 + 30 = 30 + 12
□ + 25 = 25 + 41

Written calculation

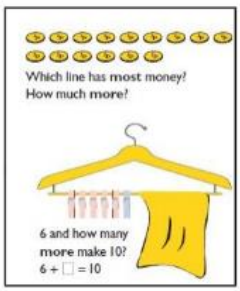
- Solve problems with addition and subtraction, applying their increasing knowledge of mental and written methods

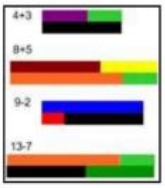
Pupils extend their understanding of the language of addition and subtraction to include sum and difference. Pupils practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using 3 + 7 = 10; 10 – 7 = 3 and 7 = 10 – 3 to calculate 30 + 70 = 100; 100 – 70 = 30 and 70 = 100 – 30. Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers.

65 = 60 + 5
65 = 50 + 15
65 = 40 + 25
65 = 30 + 35
65 = 20 + 45
65 = 10 + 55

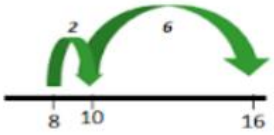
Representations to support calculations

Use a range of concrete and pictorial representations, including:

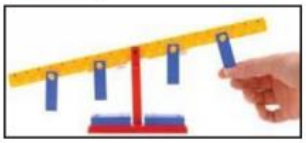


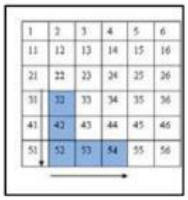


Bead strings



Number lines





Number tracks

Real everyday objects

Key Vocab

put together
add, altogether
total
take away
distance between
difference between
more than and less than
Addend
Sum

Links from other strands

- Solve problems:
- Using concrete objects, pictorial representations (numbers, quantities & measures)
- Applying increasing knowledge of mental & written methods
- Discuss and solve problems that emphasise the value of each digit in two-digit numbers
(They should) develop the concept of addition and subtraction and ... use these operations flexibly.
(Number-addition and subtraction, Non-statutory guidance.)

Addition: Year 3

Mental calculation

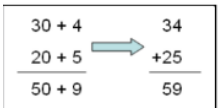
Add numbers mentally, including:
- **a three-digit number and ones**
- **a three-digit number and tens**
- **a three digit number and hundreds**

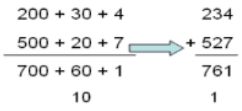
- Partition all numbers and recombine, start with TU + TU then HTU + TU
- Use hundred square, place value counters, number lines

Common mental calculation strategies:
Partitioning and recombining
Doubles and near doubles
Use number pairs to 10 and 100 Using patterns of similar calculations Adding near multiples of ten and adjusting
Using known number facts
Bridging though ten, hundred

Written calculation

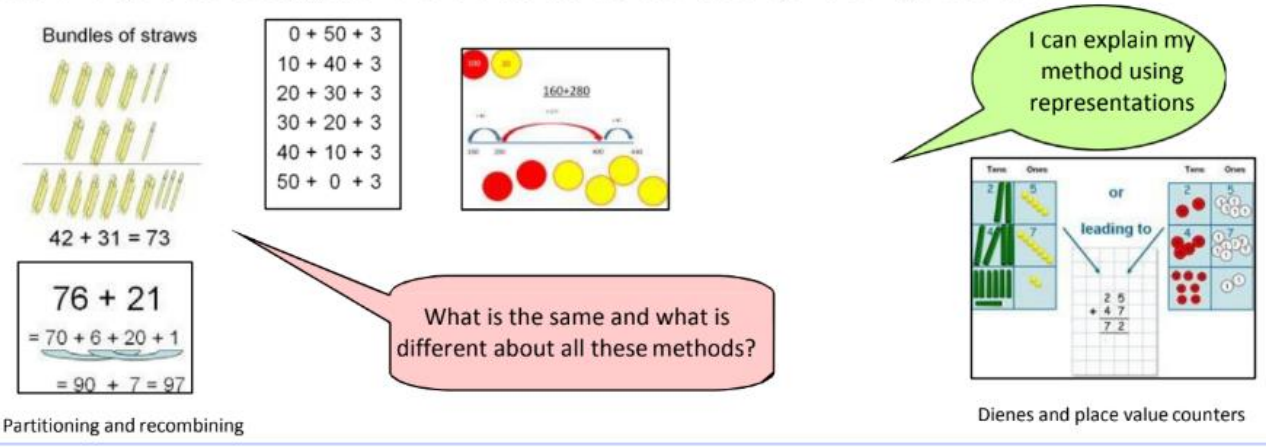
- add and subtract numbers with up to three digits, using formal written methods of columnar addition





Representations to support calculations

Use a range of concrete, pictorial and abstract representations, including those below



Key Vocab

put together
add, altogether
total
take away
distance between
difference between
more than and less than
Addend
Sum

Links from other strands

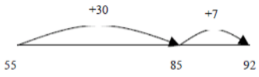
Pupils should estimate the answers to a calculation & use inverse operations to check answers.
Add amounts of money using both £ and p in practical contexts.
Measure, compare and add lengths (m/cm/mm), mass (kg/g) & volume/capacity (l/ml)
Use bar modelling to solve word problems - including missing number problems, using number facts, place value, and more complex addition

Addition: Year 4

Mental calculation

Practise mental methods with increasingly large numbers
55 + 37 = 55 + 30 + 7
= 85 + 7
= 92
Consolidate partitioning and re-partitioning
Use compensation for adding too much/little and adjusting
Use Dienes, place value counters,
empty number lines etc.

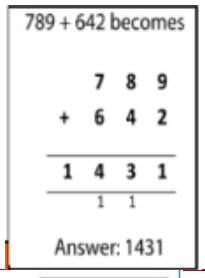
I know that 63 + 29 is the same as 63 + 30 –1



Common mental calculation strategies:
Partitioning and recombining
Doubles and near doubles
Use number pairs to 10 and 100
Adding near multiples of ten and adjusting
Using patterns of similar calculations
Using known numberfacts
Bridging though ten, hundred
Complementary addition

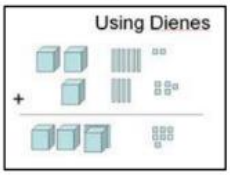
Written calculation

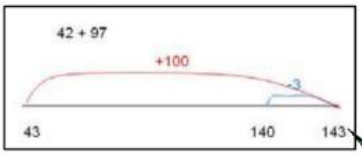
- Add numbers with up to four digits, using the formal written (columnar)method
Add three digit numbers using columnar method and then move onto 4 digits.
Include decimal addition for money - Expanded then moving to compact



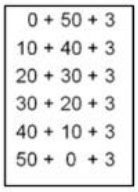
Representations to support calculations

Use physical/pictorial representations alongside expanded and columnar methods.

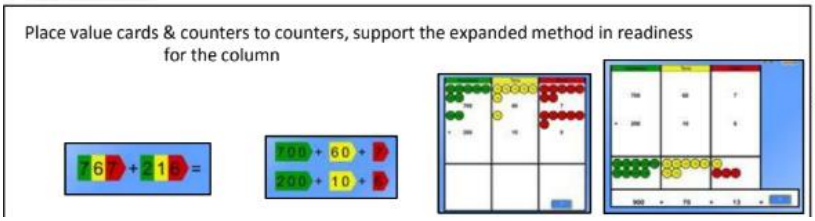




Compensating in mental addition



Re-partitioning



Ask what is the same and what is different about all these methods?

Key Vocab

put together
add, altogether
total
take away
distance between
difference between
more than and less than
Addend
Sum

Links from other strands

Estimate and use inverse operations to check answers.
- Solve addition and subtraction two step problems in context, deciding which operations and methods to use and why
- Identify, represent and estimate numbers using different representations. (Place value)
- Recognise the place value of each digit in a four-digit number.
- Estimate, compare and calculate different measures, including amounts money in £ and p (including fractions and decimals)

Addition: Year 5

Mental calculation

- Add numbers mentally with increasingly large numbers, e.g. 12 462 + 2300 = 14762
- Mentally add tenths, and one-digit numbers and tenths
- Add decimals, including a mix of whole numbers and decimals, decimals with different numbers of places, and complements of 1 (e.g. 0.83 + 0.17 = 1)

Common mental calculations
Doubles and near doubles
Adding near multiples of 10
Using patterns of similar calculations
Bridging through ten, hundred, tenth

Written calculation

Add whole numbers with more than four digits, using the formal written (columnar)method
Add three digit numbers using columnar method and then move onto 4 digits.
Include decimal addition for money

24172m	£563.14
+ 5929m	+ £207.88
30101m	£771.02
1 1 1 1	1 1 1

Representations to support calculations

Use physical/pictorial representations alongside columnar methods where needed.

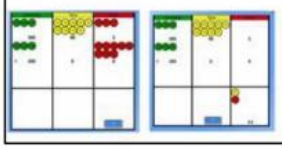
12 462 + 2300
= 12 462 + 2000 + 300
= 14 462 + 300
= 14 762

Partitioning and recombining

Ask **what is the same** and **what is different** about all these methods?

Jottings to support mental calculation

Place Value counters to support column addition



393
+ 308
1
1

Key Vocab

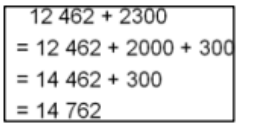
put together
add, altogether
total
more than and less than
Addend
Sum

Links from other strands

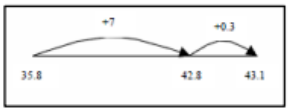
Solve problems involving up to three decimal numbers.
- Solve addition and subtraction multi step problems in context, deciding which operations and methods to use and why
- Use all four operations to solve problems involving measure [e.g. length, mass, volume, money] using decimal notation,
- Calculate the perimeter of composite rectilinear squares in centimetres and metres
- Use angle sum facts and other properties to make deductions about missing angles
- Solve comparison, sun and difference problems using information presented in a line graph

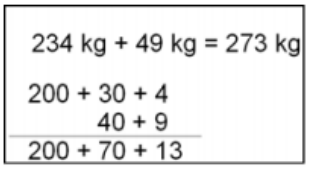
Addition: Year 6

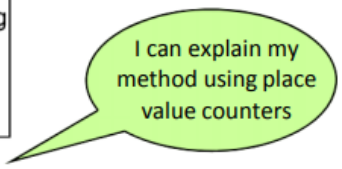
Mental calculation	**Perform mental calculations, including with mixed operations and large numbers (more complex calculations)** Children use representation of choice Consolidate partitioning and re-partitioning Use compensation for adding too much/little and adjusting Refer back to pictorial and physical representations when needed.	Common mental calculation strategies: Partitioning and recombining Doubles and near doubles Use number pairs to 10 and 100 Using patterns of similar calculations Using known number facts Bridging though ten, hundred, tenth Complementary addition Adding near multiples of ten and adjusting
Written calculation	Add larger numbers using the formal written (columnar) method Add three digit numbers using columnar method and then move onto 4 digits. Include decimal addition for money	£563.14 + £207.88 £771.02 1 1 1 789 + 642 becomes 7 8 9 + 6 4 2 1 4 3 1 1 1 Answer: 1431
Representations to support calculations	**Use physical/pictorial representations alongside columnar methods where needed. Ask what is the same and what is different?**	

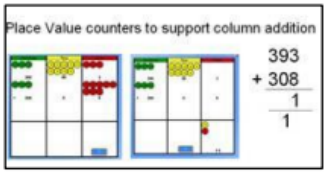


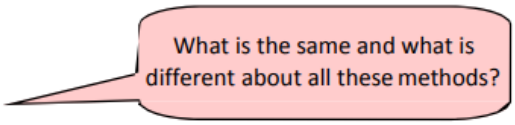
Partitioning and recombining





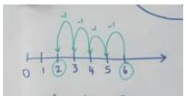
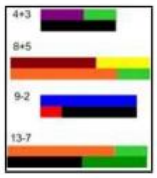
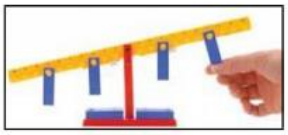
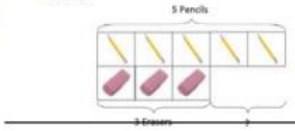
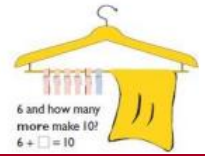






Key Vocab	*put together* *add, altogether* *total* *more than and less than* *Addend* *Sum*
Links from other strands	*Use their knowledge of the order of operations to carry out calculations involving the four operations(BIDMAS)* • *Solve problems involving all four operations* • *Algebra: use symbols and letters to represent variable and unknowns e.g. a + b = b + a* • *Solve problems involving the calculation and conversions of units of measure, using decimal notation of up to three decimal places where appropriate* • *Using the number line, pupils use, add and subtract positive and negative integers for measures such as temperature* • *Calculate and interpret the mean as an average* • *Interpret and construct pie charts and line graphs and use these to solve problems* • *Find missing angles, and express geometry relationships algebraically (e.g. d=2xr)*

Subtraction

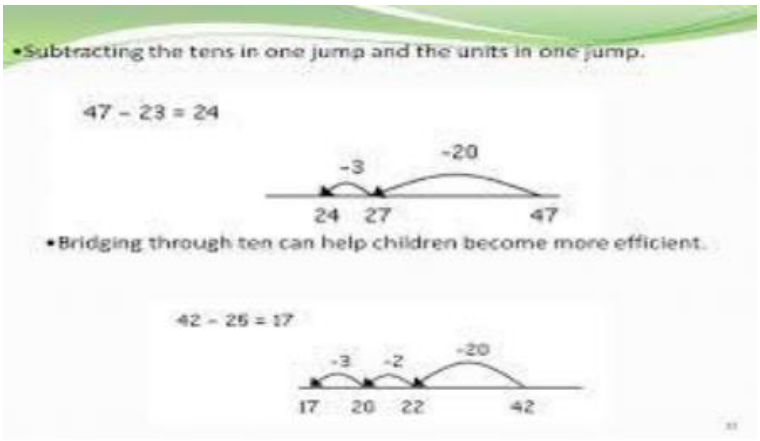
Subtraction: Year 1	
Mental calculation	**Subtract one digit and two-digit numbers to 20, including zero.** **Read, write and interpret mathematical statements using symbols (+, -, =) signs.** **Represent and use number bonds and related addition facts within 20** **Solve one-step problems using concrete objects and pictorial representations, and missing number problems such as 7 = - 9**  *Memorise and reason with number bonds Add using objects, Numicon, cubes etc and number lines and tracks Check with everyday objects Ensure pre-calculation steps are understood, including: Counting objects, Conservation of number*
Written calculation	**Subtract one-digit and two-digit numbers to 20, including zero** $7-3=\square, 7-\square=4$ $\square-3=4,\ 17-13=\square$ $17-\square=4$  **Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs .**  **Represent and use number bonds and related subtraction facts within 20.**
Representations to support calculations	Use a range of concrete and pictorial representations, including:   Hands, and children themselves.  Bead strings, number tracks and lines  Which line has most money? How much more?   **Subtraction: Comparison Model** Peter has 5 pencils and 3 erasers. How many more pencils than erasers does he have?   6 and how many more make 10? 6 + ☐ = 10
Key Vocab	*put together* *add, altogether* *total* *take away* *distance between* *difference between* *more than and less than* *Sum*
Links from other strands	*-Pupils should combine and increase numbers, counting forwards and backwards.* *(They should) develop the concept of addition and subtraction and use these operations flexibly.* *Pupils discuss and solve problems in familiar practical contexts.* *Pupils compare, describe and solve practical (measurement) problems.*

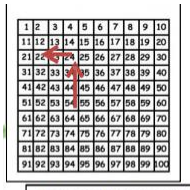
Subtraction: Year 2

Mental calculation

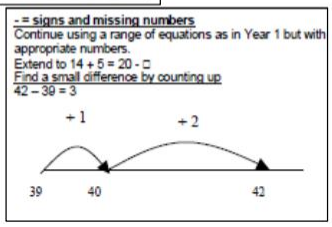
Add numbers using concrete objects, pictorial representations, and mentally, including:
- **a two-digit number and ones**
- **a two-digit number and tens**
- **two two-digit numbers**
- **adding three one-digit numbers**

Jottings to support informal methods:





54—32 = 22



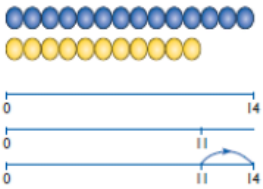
Written calculation

Representations to support calculations

Informal methods to support written subtraction calculations

Practical portioning of a 2-digit number

In Year 1 leads to:



The difference between 11 and 14 is 3.
14 – 11 = 3
11 + □ = 14

Bundles of straws or dienes to represent and partition 2 digit numbers.
Subtract (without decomposition) using partitioning and equipment, e.g.

To calculate 35-22, remove 22.

Then record: **35-22=13**.

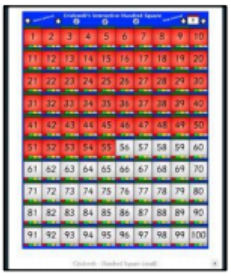
Continue to use of a range of concrete and pictorial representations from Year 1—including Bar model to support understanding of **difference. (See below.)**

Key Vocab

put together
add, altogether
total
take away
distance between
difference between
more than and less than
Addend
Sum

Links from other strands

Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100. Pupils should partition to support subtraction.



55 + 45 = 100
45 + 55 = 100
35 + 65 = 100
100 – 55 = 45
100 – 45 = 55
100 – 35 = 65

Solve problems with addition and subtraction:

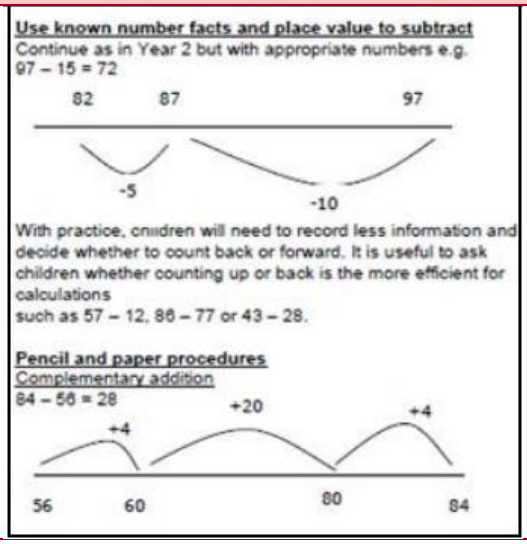
- **using concrete objects and pictorial representations, involving numbers, quantities and measures**
- **applying knowledge of mental and written methods**
- ***Pupils extend their understanding of the language of addition and subtraction to include sum and difference.***

Subtraction: Year 3

Mental calculation

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

Use a number line, dienes, hundred squares, two-hundred squares, and similar representations, to support mental calculations. (See Representations section below.)



Written calculation

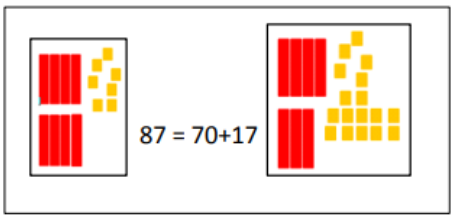
- Subtract numbers with up to three digits, using formal written methods of columnar subtraction.

(1)Extended columnar - no exchange

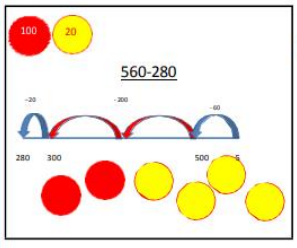
Extended method 87 - 53 =

80 and 7
- 50 and 3
30 and 4 = 34

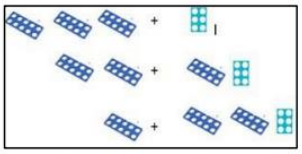
with exchange:
87-58 becomes
70 +1 7
-50 + 8
20 + 9



Representations to support calculations



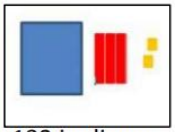
Partitioning and re- partitioning support the understanding of place-value.



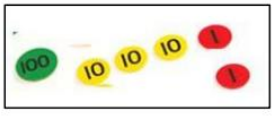
30 + 6
20 + 16
10 + 26

All of these representations still comprise the amount 36

Introduce transition from concrete place value representations, (e.g. dienes) to pictorial – such as place value counters or money.



132 in dienes



132 in place value counters.

Revert to concrete and expanded methods whenever difficulties arise.

Key Vocab	*put together* *add, altogether* *total* *take away* *distance between* *difference between* *more than and less than* *Addend* *Sum*
Links from other strands	Money and calculating duration of events For example: “Add and subtract amounts of money to give change, using both £ and p in practical contexts.” Use bar modelling to solve word problems - including missing number problems, using number facts, place value, and more complex subtractions

Subtraction: Year 4

Mental calculation

Continue to practise mental methods with increasingly large numbers to aid fluency. (From Non–Statutory Guidance). Methods to support fluent calculation and encourage efficiency of method:

- *Find a small difference by counting up. E.g. 5003—4996*

This could be done using an empty number line.

- *Subtract nearest multiple of ten and adjust.*

Children should recall and use number facts to reduce the number of steps.

- *Partition larger numbers*

Whenever possible, children should be encouraged to visualise number lines and other basic, supporting representations to promote fluent work with- out jottings.

Written calculation

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

Build on formal, extended method (See Year 3) using exchange wherever necessary. Continue to use representations and manipulatives to develop understanding of place value.

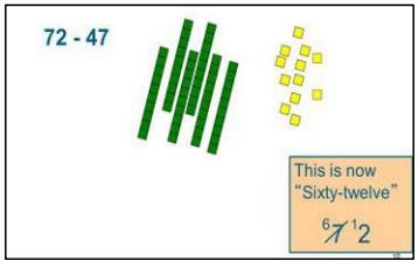
Moving to compact method

372—147 =

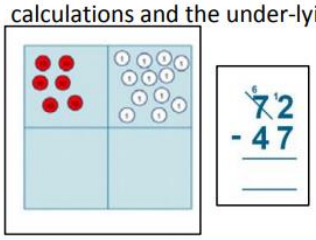
$$\begin{array}{r} 300 + 70 + 2 \\ -100 + 40 + 7 \end{array} \rightarrow \begin{array}{r} 300 + 60 + 12 \\ -100 + 40 + 7 \\ \hline 200 + 20 + 5 \end{array} \rightarrow \begin{array}{r} {}^{60}\not{7}\not{0}\ {}^{1}2 \\ -\ 100 + 40 + 7 \\ \hline 200 + 20 + 5 \end{array}$$

Apply understanding of subtraction with larger integers to that of decimals in context of money and measures. (See Year 5.)

Representations to support calculations



Dienes blocks or place value counters can be used to model calculations and the under-lying place value concepts.



Use physical and / or pictorial representations and expanded algorithms alongside columnar methods. Ask: *What is the same? What's different?* Compare and discuss the suitability of different methods in context. Pupils **decide which operations and methods to use and why.**

I would count on using a numberline to calculate 5003-4896 because the numbers are close together.

Key Vocab

put together
add, altogether
total
take away
distance between
difference between
more than and less than
Addend
Sum

Links from other strands	**Identify, represent and estimate numbers using different representations. (Place value)** **Recognise the place value of each digit in a four-digit number.** **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.** **Estimate, compare and calculate different measures, including money in pounds and pence.**

Subtraction: Year 5

Mental calculation

Subtract numbers mentally with large numbers E.g. 12 462 – 2300 = 10 162 • Use rounding to check answers to calculations In the context of a problem. *Pupils practise adding and subtracting decimals Including a mix of whole numbers and decimals with different numbers of place values and complements to 1 (for example, 1 - 0.17 = 0.83).* • Pupils mentally add and subtract tenths, and one-digit whole numbers and tenths.	Find difference by counting up Partitioning Applying known facts Bridging through 10 and multiples of 10 Subtracting 9, 11 etc by compensating *Children use, or visualise, representation of choice. Refer back to physical representations as required.*

Written calculation

Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction).
(Pupils) practise adding and subtracting decimals.
Begin with three-digit numbers using formal, columnar method; then move into four-digit numbers.

As in Year 4, compare physical and / or pictorial representations and expanded algorithms alongside columnar methods. Ask: *What is the same? What's different?*
Compare and discuss the suitability of different methods, (mental or written), in context.
Revert to expanded methods whenever difficulties arise

£17.34—£12.16

What is the same about these models? What's different?

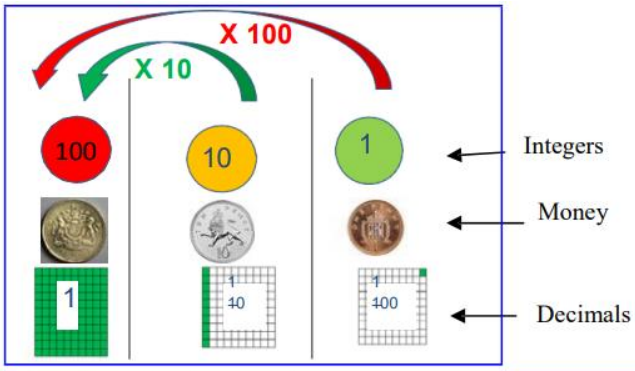
1000+700+20+14p
−1000+200+10+6p
500+10+8p

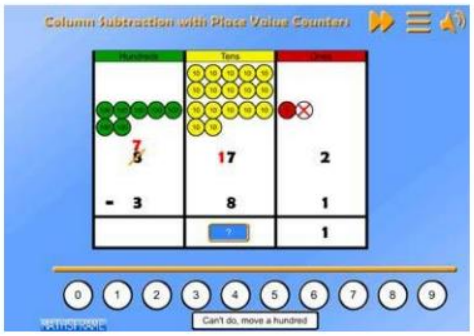
2
1734p
-1216p
518p

£ 2
17.34
-12.16
5.18

Relate place value of decimals with that of whole numbers using representations. See below.

Representations to support calculations

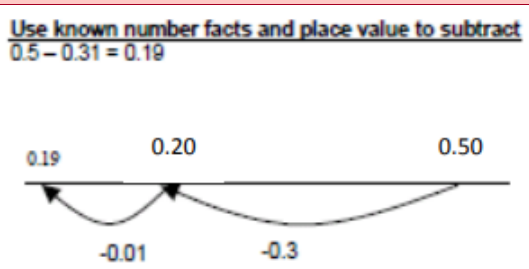
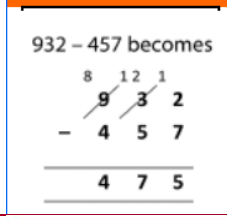
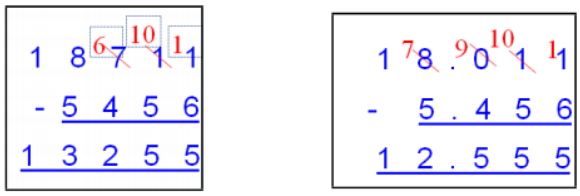
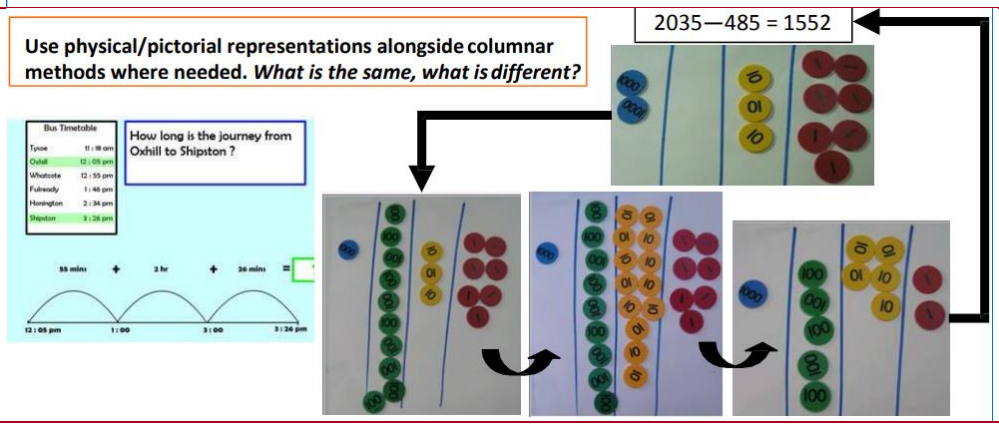




Use physical and pictorial representations to stress the place value relationships between money, decimals and whole numbers. A place value mat such as this one could be used, moving away from the traditional: *Hundreds, tens and ones model* used in Lower KS2 and KS1.

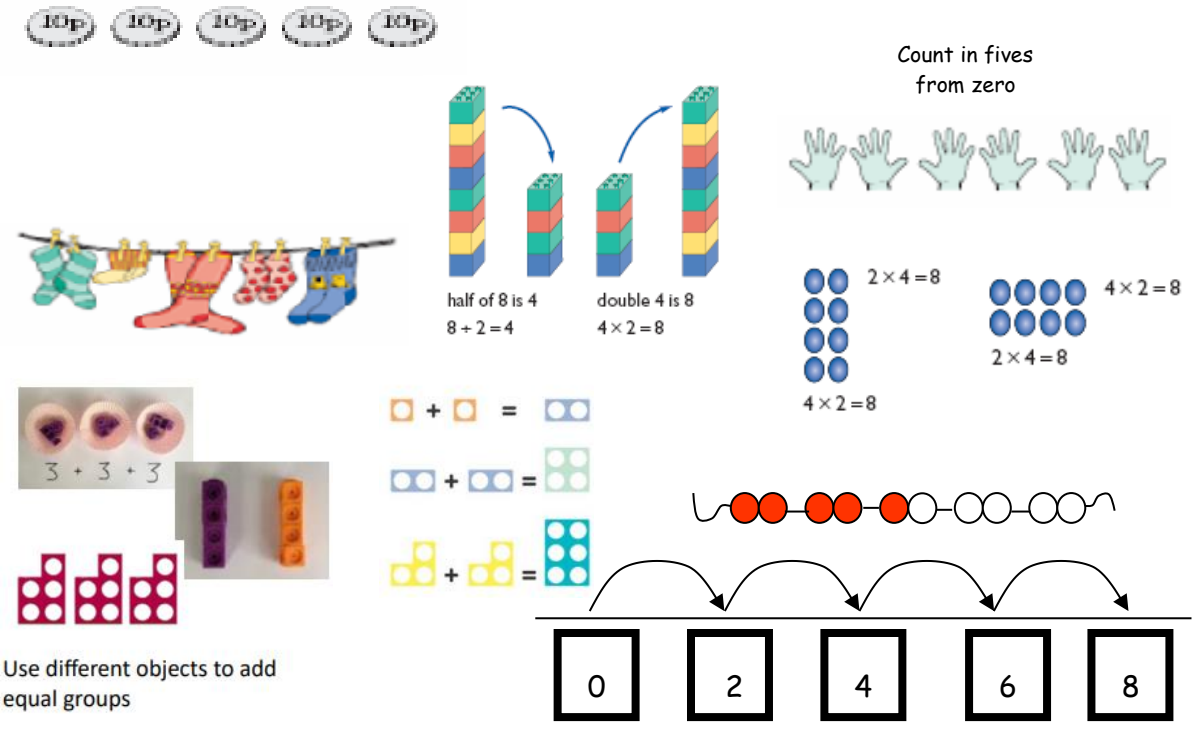
Key Vocab	*put together* *add, altogether* *total* *more than and less than* *Addend* *Sum*
Links from other	**Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign. Use all four operations to solve problems involving time, money and measure using decimal notation. (up to 3d.p.)**

Subtraction: Year 6

Mental calculation	Perform mental calculations, including with mixed operations and large numbers. • Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. • They undertake mental calculations with increasingly large numbers and more complexcalculations	
Written calculation	**Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction).** **Solve problems involving the calculation and conversions of units of measure, using decimal notation of up to three decimal places where appropriate. (MEASURES)** Move towards consolidation of formal, columnar method. For more complex calculations, with increasingly larger or smaller numbers, compare representations and expanded algorithms alongside columnar methods. Ask: What is the same? What's different? Compare and discuss the suitability of different methods, (mental or written), in context. Revert to expanded methods whenever difficulties arise  Consolidate columnar methods , paying particular attention to the occurrence of zeros as place holders. 
Representations to support calculations	**Use physical/pictorial representations alongside columnar methods where needed. *What is the same, what is different?*** 	
Key Vocab	*put together* *add, altogether* *total* *more than and less than* *Addend* *Sum*	

Links from other strands	**Use their knowledge of the order of operations to carry out calculations involving the four operations (BODMAS/BIDMAS)** **Solve problems involving all four operations** **Algebra: use symbols and letters to represent variable and unknowns e.g. a + b = b + a** **Using the number line, pupils use, add and subtract positive and negative integers for measures such as temperature.**

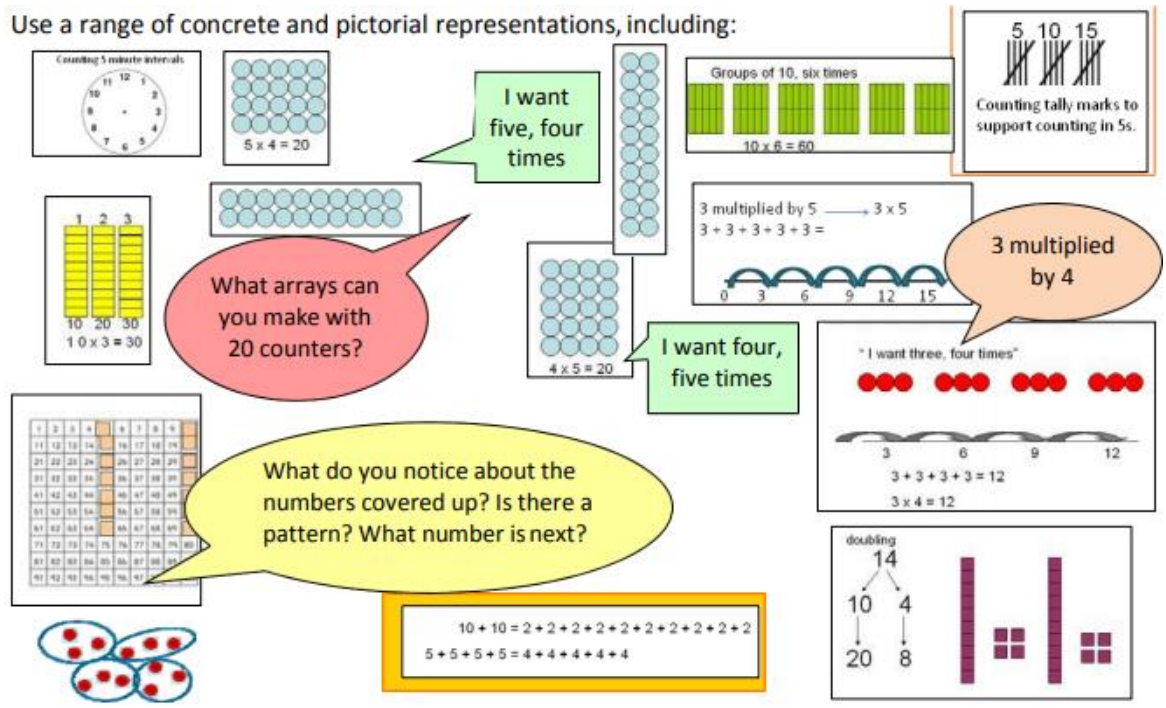
Multiplication

Multiplication: Year 1	
Mental calculation **Written calculation**	- 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; doubling numbers and quantities. They make connections between arrays, number patterns, and counting in twos, fives and tens.*
Representations to support calculations	

Key Vocab	lots of groups of times multiply multiplication multiple product once, twice, three times array, row, column double repeated addition
Links from other strands	Count in multiples of twos, fives and tens (from Number and place value), as above • Counting in twos, five and tens from different multiples to develop their recognition of patterns in the number system • They discuss and solve problems in familiar practical contexts, including using quantities. • Using bar modelling to solve simple problems – how many sweets in 5 bags?

Multiplication: Year 2

Mental calculation	**-recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers** **- 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 relate these to fractions and measures (for example, 40 ÷ 2 = 20, 20 is a half of 40).*
Written calculation	**calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs** *- 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 use commutativity and inverse relations to develop multiplicative reasoning (for example, 4 × 5 = 20 and 20 ÷ 5 = 4).* 7 x 2 = □ □ = 2 x 7 7 x □ = 14 14 = □ x 7

Representations to support calculations	
Key Vocab	lots of groups of times multiply multiplication multiple product once, twice, three times array, row, column double repeated addition
Links from other strands	- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. - Use commutativity and inverse relations to develop multiplicative reasoning (e.g. 4 x 5 = 20 and 20 ÷ 5 = 4) - Statistics—interpret and construct simple pictograms, tally charts and block diagrams - Measurement— counting 5 minute intervals on a clock face - Place value count in steps of 2, 3 and 5 from 0 and in tens from any number, forwards and backwards

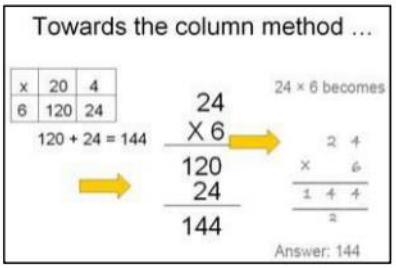
Multiplication: Year 3

Mental calculation	**- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables** **- 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.** *- 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 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (for example, using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (for example, 30 × 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3).* *- 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).*

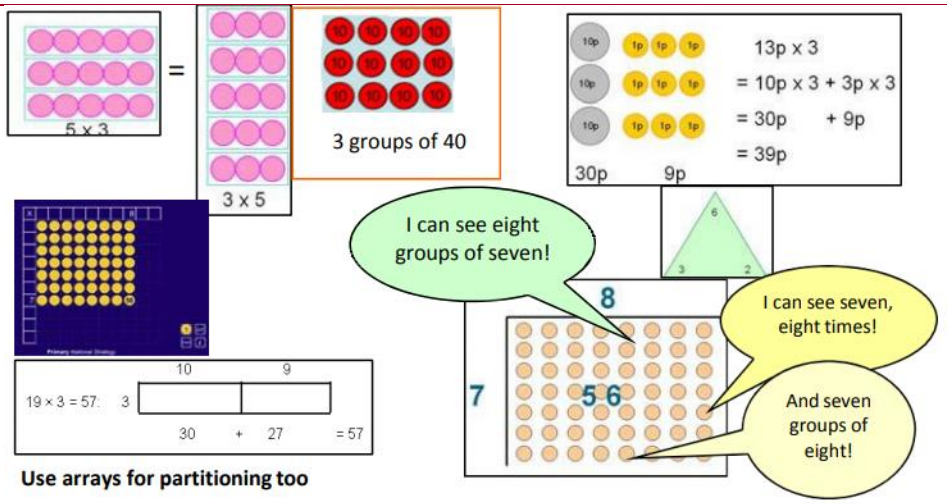
Written calculation

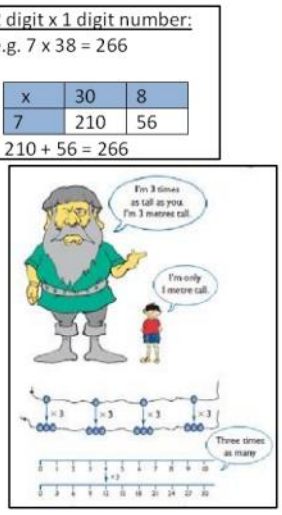
- **write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods**

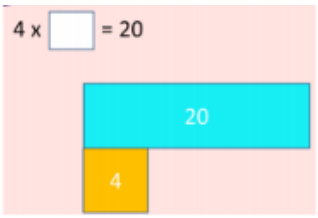
- Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division.

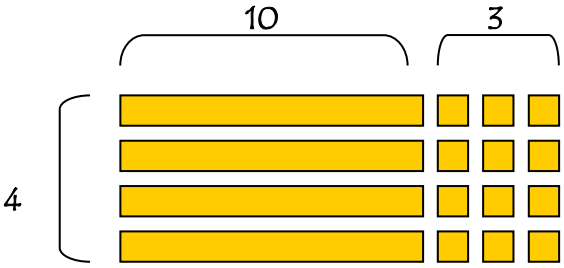


Representations to support calculations









Key Vocab

lots of	product
groups of	once, twice, three times
times	array, row, column
multiply	double
multiplication	repeated addition
multiple	multiplicand, multiplier

Links from other strands

The comparison of measures includes simple scaling by integers (for example, a given quantity or measure is twice as long or five times as high)

- Pupils now use multiples of 2, 3, 4, 5, 8, 10, 50 and 100.
- Pupils understand and use simple scales (for example, 2, 5, 10 units per cm) in pictograms and bar charts with increasing accuracy
- solve problems, including missing number problems, involving multiplication , including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Multiplication: Year 4

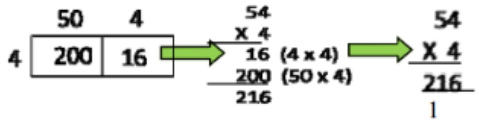
Mental calculation

- 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
- 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 ÷ 3 = 200 can be derived from 2 x 3 = 6)..
- Pupils write statements about the equality of expressions (for example, use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4).
- They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 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.

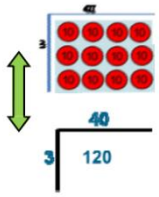
Written calculation

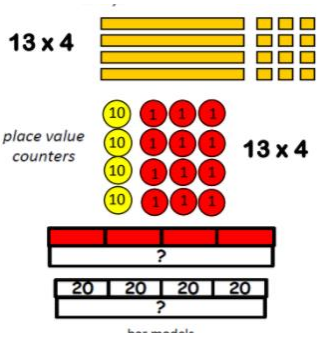
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- Estimate before calculating
- Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers
- Introduce alongside grid method



Representations to support calculations

Use arrays made with place value counters to demonstrate the link between multi- plication and division. This will support understanding of the grid method.





Expanded methods - grid and area:

	10	3
4	40	12

x	10	3
4	40	12

Progressing to developing fluency in short multiplication:

```
 1 3          1 3 3
x  4         x   4
-----        -------
 5 2          5 3 2
 1            1 1
```

Start with digits that are five or below so children can practise the method without encountering difficulty with multiplication tables

Key Vocab

lots of	product
groups of	once, twice, three times
times	array, row, column
multiply	double
multiplication	repeated addition
multiple	multiplicand, multiplier

Links from other strands	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. • Convert between different units of measure (e.g. km to m) - use multiplication to convert from larger to smaller units • Understand the relation between non-unit fractions and multiplication/division of quantities. With particular emphasis on tenths and hundredths • relate area to arrays and multiplication. • Problem solving work can involve finding all possibilities and combinations drawing on knowledge of multiplication tables facts • Pupils understand and use a greater range of scales in their representations (Statistics)

Multiplication: Year 5

Mental calculation

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two 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 and divide numbers mentally drawing upon known facts
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

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 ÷ 4 = 4 98 = 24 r 2 = 24 2 1 = 24.5 ≈ 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 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 92 x 10). Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example, 13 + 24 = 12 + 25; 33 = 5 x)

Written calculation

- 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
- recognise and use square numbers and cube numbers, and the notation for squared and cubed
- Pupils practise and extend their use of the formal written methods of short multiplication and short division

Representations to support calculations

Long multiplication

```
  1 8
x 1 3
  5 4
1 8 0
2 3 4
```

Short multiplication
342 x 7 becomes

```
  3  4  2
  x     7
2  3  9  4
   2  1
```

Answer = 2394

Key Vocab

lots of	product
groups of	once, twice, three times
times	array, row, column
multiply	double
multiplication	repeated addition
multiple	multiplicand, multiplier

Links from other strands	• identify multiples & factors, including finding all factor pairs of a number, & common factors of two 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 • solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes, and including understanding the meaning of the equals sign • solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates • use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. • convert between different units of metric measure; problems including money,. Other links: ratio, *Pupils use their knowledge of place value and multiplication and division to convert between standard units. Pupils calculate the perimeter of rectangles and related composite shapes, including using the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example 4 + 2b = 20 for a rectangle of sides 2 cm and b cm and perimeter of 20cm. Pupils calculate the area from scale drawings using given measurements.*

Multiplication: Year 6

Mental calculation	**- 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 problems involving addition, subtraction, multiplication and division** *Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods short and long multiplication. 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 x 3 = 5 and (2 + 1) x 3 = 9.*
Written calculation	**- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication**
Representations to support calculations	**Short multiplication:** 24 × 6 becomes 2 4 × 6 1 4 4 2 Answer: 144 342 × 7 becomes 3 4 2 × 7 2 3 9 4 2 1 Answer: 2394 2741 × 6 becomes 2 7 4 1 × 6 1 6 4 4 6 4 2 Answer: 16 446 **Long multiplication:** 124 × 26 becomes 1 2 1 2 4 × 2 6 7 4 4 2 4 8 0 3 2 2 4 1 1 Answer: 3224

Key Vocab	lots of	product
	groups of	once, twice, three times
	times	array, row, column
	multiply	double
	multiplication	repeated addition
	multiple	multiplicand, multiplier
Links from other strands	*•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 problems involving addition, subtraction, multiplication and division	
	• explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.	
	• Fractions, decimals and percentages including equivalences in different contexts.	
	•solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	
	•solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison	
	• solve problems involving similar shapes where the scale factor is known or can be found	
	• solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.	
	•Algebra including formulae, linear number sequences, combinations of variables	
	•Measurement including solving problems with conversion of units, decimal notation, area &volume	
	•Statistics including pie charts, line charts and calculating the mean	

Division

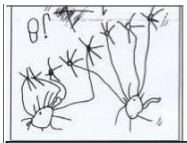
Division: Year 1

Mental calculation

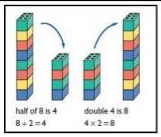
- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

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.

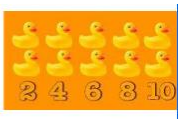
Written calculation



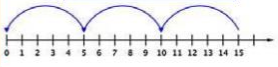
Pictorial jottings to support the calculation of 8 ÷ 4



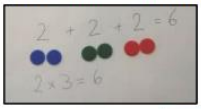
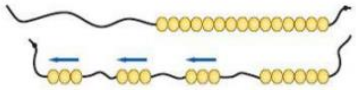
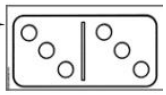
Count on or back in 2s, 5s and 10s and useful look for patterns.



Children should experiment with the concepts of sharing and grouping in a number of contexts. Initially they use their own recording—moving towards fluent, symbolic notation in Year 2.
Conceptual understanding and recording should be continuously supported by the use of **arrays** as a default model, as well as other representations, (see below.)



The relationship between multiplication and division must be continually considered.

Representations to support calculations	Use a range of concrete and pictorial representations, including: • Manipulatives to support children's own recording; and understanding of *sharing* and the link with multiplication. *"How can we share 6 cakes between 3 people?*  Here, the cakes are placed in an array formation.  *How many 2 tiles can we fit on the 6 tile?*  Moving from concrete to pictorial, counters to represent the cakes to reinforce the relationship between multiplication and division. • Manipulatives, and real-life objects to support children's own recording; and understanding of *grouping* and the link with multiplication.  Coat hangers and socks support calculation of 8÷2 Bead strings  *"Double 3 is 6. Half of 6 is 3."*  • Dominoes and dice to reinforce concepts of doubling and halving.
Key Vocab	groups of divided by left over lots of share remainder Half halve double times
Links from other strands	They practise counting as reciting numbers and counting as enumerating objects, and counting in twos, fives and tens from different multiples to develop their recognition of patterns in the number system (for example, odd and even numbers). (PLACE VALUE). Pupils are taught half and quarter as 'fractions of' by solving problems using shapes, objects and quantities. (FRACTIONS)

Division: Year 2

Mental calculation	**-recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers** **- 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. They connect the 10 multiplication table to place value, and the 5 multiplication table to the divisions on the clock face. They begin to relate these to fractions and measures (for example, 40 ÷ 2 = 20, 20 is a half of 40).*
Written calculation	**calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs** *- 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 use commutativity and inverse relations to develop multiplicative reasoning (for example, 4 × 5 = 20 and 20 ÷ 5 = 4).* 7 x 2 = □ □ = 2 x 7 7 x □ = 14 14 = □ x 7

Representations to support calculations

Use a range of concrete and pictorial representations, including:

- Arrays

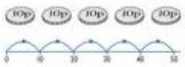
7 x 2 = 14

14 ÷ 2 = 7

2 x 7 = 14

14 ÷ 7 = 2

- Number lines to support grouping



Is 14 an odd number? How do you know?

How many groups of 5 minutes have passed when the minute

Representations to support multiplicative reasoning:

Using Dienes: *"If 40 ÷ 10 = 4 and 30 ÷ 10 = 3, what do you think 70 ÷ 10 would be? Why?"*

Three groups of two is equal to six.
Six divided into three equal groups is equal to two.

Key Vocab

groups of	Half
divided by	halve
left over	double
lots of	times
share	
remainder	

Links from other strands

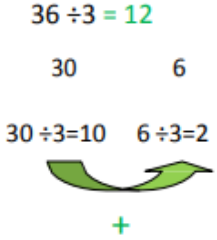
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.
- Use commutativity and inverse relations to develop multiplicative reasoning (e.g. 4 x 5 = 20 and 20 ÷ 5 = 4)
- Statistics—interpret and construct simple pictograms, tally charts and block diagrams
- Place value count in steps of 2, 3 and 5 from 0 and in tens from any number, forwards and backwards

Division: Year 3

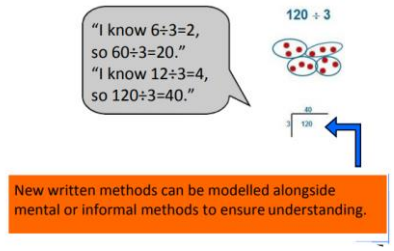
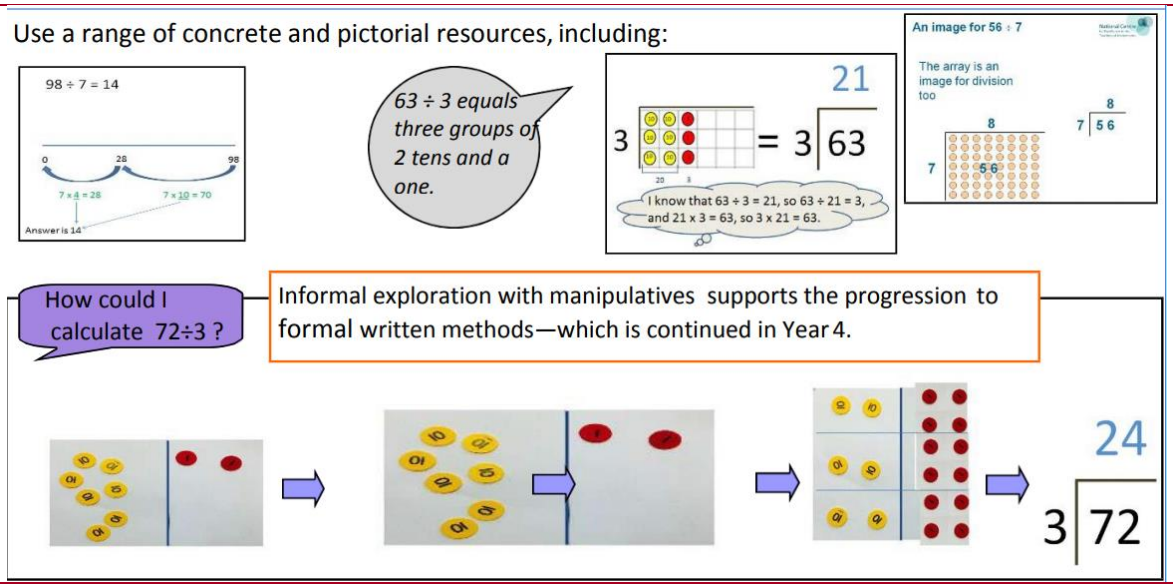
Mental calculation

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

- Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency.
- Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (for example, using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (for example, 30 × 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3).



- 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).

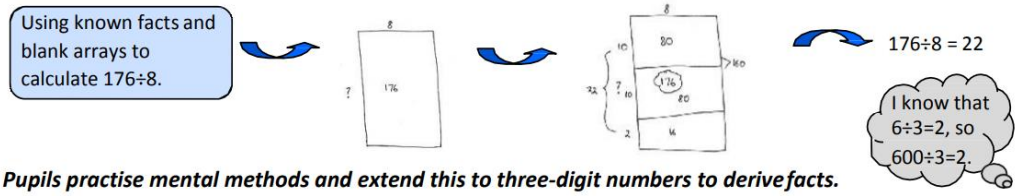
Written calculation	- **write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods** *- Pupils develop reliable written methods 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.* 
Representations to support calculations	Use a range of concrete and pictorial resources, including: 
Key Vocab	groups of divided by left over lots of share remainder Half halve double times dividend
Links from other strands	Solve problems, including missing number problems division

Division: Year 4

Mental calculation

- recall multiplication and division facts for multiplication tables up to 12 × 12
- recognise and use factor pairs and commutativity in mental calculations
- 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

- 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 ÷ 3 = 200 can be derived from 2 x 3 = 6)..
- Pupils write statements about the equality of expressions (for example, use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4).
- They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 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.

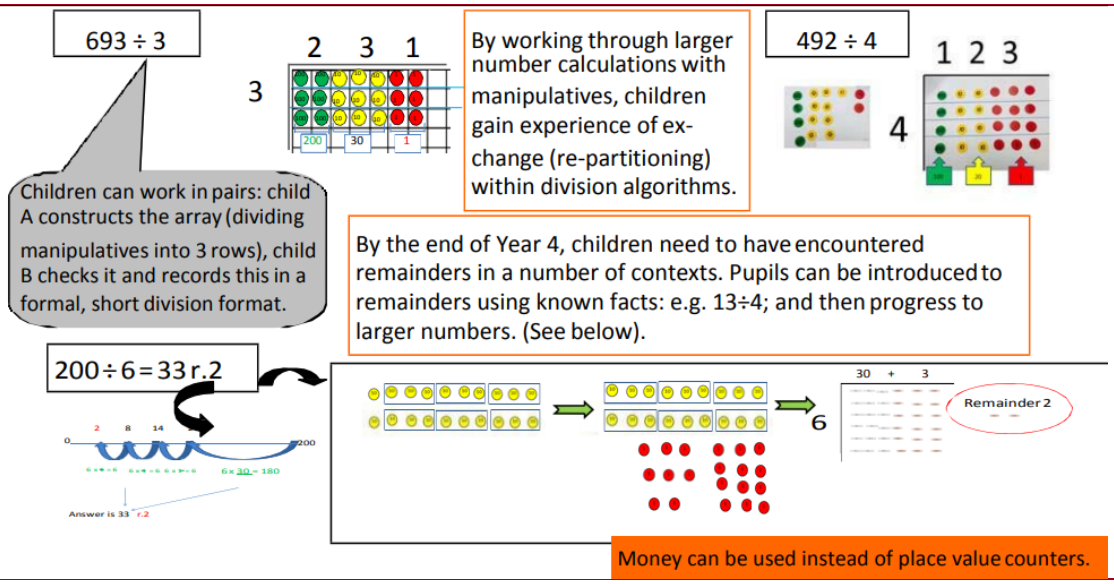


Pupils practise mental methods and extend this to three-digit numbers to derive facts.

Written calculation

- Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers

Representations to support calculations



Key Vocab

groups of	Half
divided by	halve
left over	double
lots of	times
share	dividend
remainder	

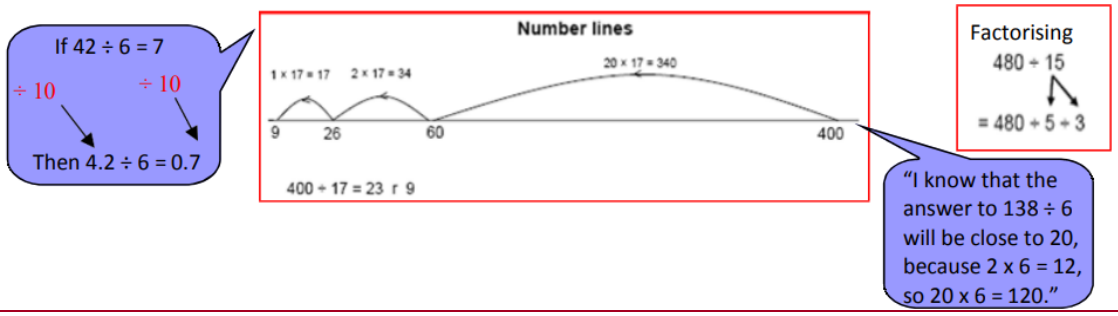
Links from other strands	Convert between different units of measure [for example, kilometre to metre; hour to minute] • Estimate, compare and calculate different measures, including money in pounds and pence (MEASURES) • Recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten. (FRACTIONS)

Division: Year 5

Mental calculation

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two 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 and divide numbers mentally drawing upon known facts
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

- 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 ÷ 4 = 4 98 = 24 r 2 = 24 2 1 = 24.5 ≈ 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 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 92 x 10).
- Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example, 13 + 24 = 12 + 25; 33 = 5 x)



Written calculation

- 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.
- Pupils practise and extend their use of the formal written methods of short multiplication and short division

98 ÷ 7 becomes

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\,9^{2}\ 8} \end{array}$$

Answer: 14

432 ÷ 5 becomes

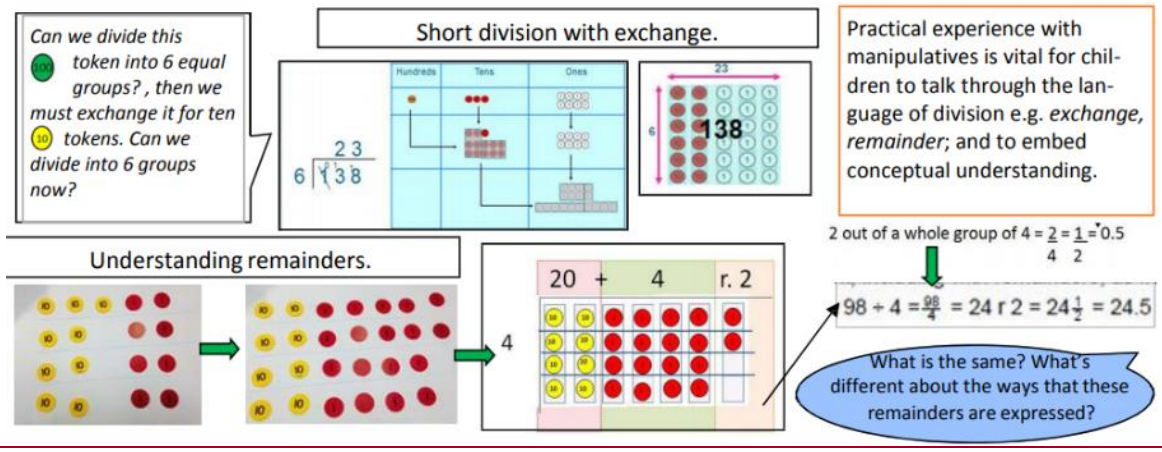
$$\begin{array}{r} 8\ \ 6\ \text{r}\,2 \\ 5\overline{)\,4\ 3^{3}\ 2} \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 4\ \ 5\ \text{r}\,1 \\ 1\ 1\overline{)\,4\ 9^{5}\ 6} \end{array}$$

Answer: $45\frac{1}{11}$

Representations to support calculations	
Key Vocab	groups of divided by left over lots of share remainder Half halve double times dividend quotient
Links from other strands	Pupils use all four operations in problems involving time and money, including conversions. …..using decimal notation, including scaling. • calculate and compare the area of rectangles (including squares). (MEASURES)

Division: Year 6

Mental calculation

- 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 problems involving addition, subtraction, multiplication and division
- identify common factors, common multiples and prime numbers

- Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods short and long multiplication.
- 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 x 3 = 5 and (2 + 1) x 3 = 9.

Written calculation

- 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

Long division

432 ÷ 15 becomes

```
        2  8   r 12
   ┌──────────
15 │ 4  3  2
     3  0  0
   ──────────
     1  3  2
     1  2  0
   ──────────
        1  2
```

Answer: 28 remainder 12

432 ÷ 15 becomes

```
        2  8
   ┌──────────
15 │ 4  3  2
     3  0  0     15×20
   ──────────
     1  3  2
     1  2  0     15×8
   ──────────
        1  2
```

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

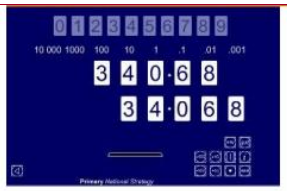
Answer: $28\frac{4}{5}$

432 ÷ 15 becomes

```
        2  8 · 8
   ┌──────────
15 │ 4  3  2 · 0
     3  0  ↓
   ──────────
     1  3  2
     1  2  0
   ──────────
        1  2  0
        1  2  0
   ──────────
              0
```

Answer: 28·8

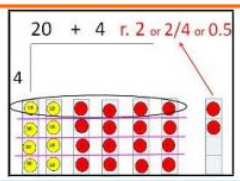
Representations to support calculations



£1362.72 ÷ 40 = ?

£1362.72 ÷ 4 = £340.68
[½ and ½ again.]
£340.68 ÷ 10 = £34.068
which rounds to £34.07.

To introduce the long division model, use a calculation which can be represented both with manipulatives and by a short division algorithm. Use questioning and discussion to compare written methods.




```
      2  4  r.2
   ┌──────
4  │ 9 ¹8
   - 8  0   (4 x 20 )
     1  8
   - 1  6   (4 x 4 )
        2
```

What's the same? What's different?

Key Vocab

groups of	Half
divided by	halve
left over	double
lots of	times
share	dividend
remainder	quotient

Links from other strands	Pupils are introduced to the division of decimal numbers by one-digit whole number, initially, in practical contexts involving measures and money. They recognise division as the inverse of multiplication. • Pupils also develop their skills of rounding and estimating. This includes "8 is the best estimate for 72.34 ÷ 8.91; because the numbers in the algorithm can be rounded to 72 ÷ 9." rounding answers to a specified degree of accuracy and checking the reasonableness of their answers. (FRACTIONS) • solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. • use, read, write and convert between standard units….using decimal notation to up to 3d.p. (MEASURES) • interpret and construct pie charts and line graphs and use these to solve problems • calculate and interpret the mean as an average.(STATISTICS) • solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts (RATIO ANDPROPORTION)