Holy Trinity CofE Primary School



Calculation Policy

2021-22

Year I

Addition

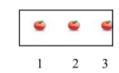
Calculations Menta

- 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 $7 = \square - 9$
- · Given a number, identify (and use the language) one more

Calculations Written

- •Begin to compare (what's the same/different?) for commutative sums e.g 3 +7 = 7 + 3
- •Memorise and reason with number bonds to 10 & 20 in several forms
- Add using objects, Numicon, cubes etc and number lines and tracks
- Check with everyday objects
- Ensure pre-calculation steps are understood, including:
 - Counting objects (including solving simple concrete problems
 - Conservation of number:
 - Recognise place value in numbers beyond 20
 - Counting as reciting and as enumerating



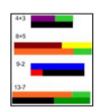


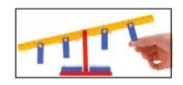
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Use a range of concrete and pictorial representations, including:













Number lines







Number tracks



Bead strings





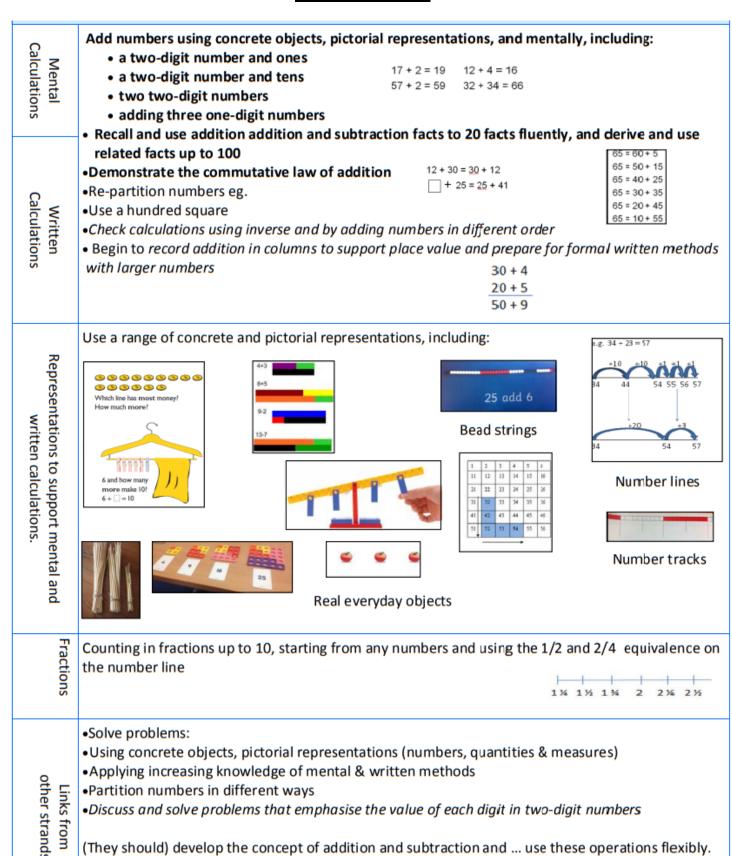
- Combine and increase numbers, counting forwards and backwards.
- Develop the concept of addition and subtraction and ... use these operations flexibly.
- Discuss and solve problems in familiar practical contexts, including using quantities
- Compare, describe and solve practical [measure] problems 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.

Links from other strands

Representations to support mental and written

calculations

Addition

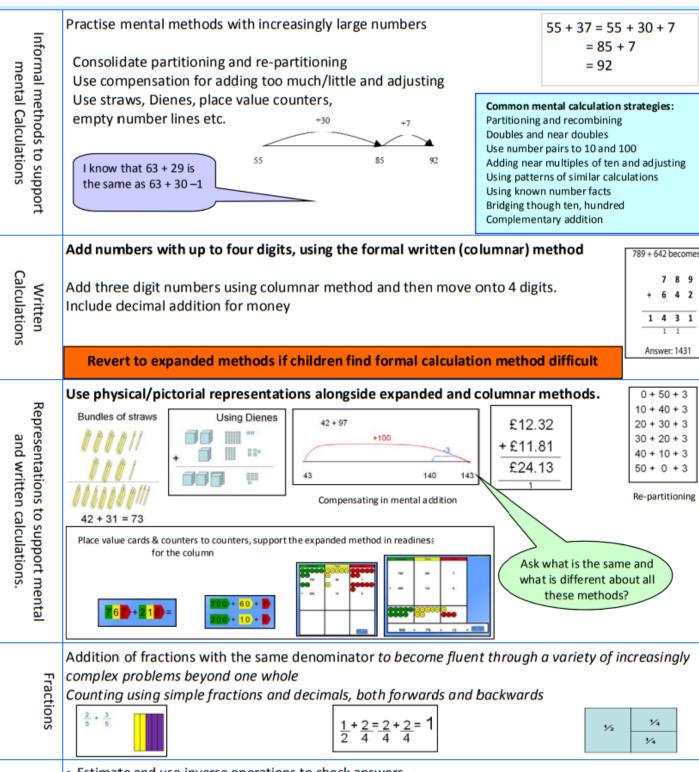


(Number-addition and subtraction, Non-statutory guidance.)

Addition

Add numbers mentally, including: Common mental calculation strategies: a three-digit number and ones Partitioning and recombining a three-digit number and tens Doubles and near doubles Calculations Use number pairs to 10 and 100 Mental a three digit number and hundreds Adding near multiples of ten and adjusting Partition all numbers and recombine, start with Using patterns of similar calculations TU + TU then HTU + TU Using known number facts Bridging though ten, hundred Use straws, dienes, place value counters, Complementary addition empty number lines Add numbers with up to three digits, using formal written (columnar) methods Add to three digit numbers using physical and abstract representations (e.g. straws, dienes, place value counters, empty number lines) Calculations Written raws, dienes, place value counters, empty number lines 200 + 30 + 4 234 30 + 4500 + 20 + 7 __ + 527 20 + 5 +25 700 + 60 + 1 761 50 + 9 10 Revert to concrete representations if children find expanded/column methods difficult Use a range of concrete, pictorial and abstract representations, including those below Representations to support menta Bundles of straws 0 + 50 + 3I can explain my and written calculations. 10 + 40 + 3method using 20 + 30 + 3representations 30 + 20 + 3 40 + 10 + 3 50 + 0 + 342 + 31 = 7376 + 21What is the same and what is = 70 + 6 + 20 + 1 different about all these methods? = 90 + 7 = 97Dienes and place value counters Partitioning and recombining Addition of fractions with the same denominator within one whole. Addition of fractions with the same denominator Fractions 2 + 3 = 5 5 - 5Pupils should estimate the answers to a calculation & use inverse operations to check answers. other strands Add amounts of money using both £ and p in practical contexts. Links from Measure, compare and add lengths (m/cm/mm), mass (kg/g) & volume/capacity (l/ml)

Addition



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)

<u>Year 5</u>

Addition

Informal methods to support mental Calculations

- Add numbers mentally with increasingly large numbers, e.g. 12 462 + 2300 = 14 762
- 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)

Children use representation of choice 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 Adding near multiples of ten and adjusting Using patterns of similar calculations Using known number facts Bridging though ten, hundred, tenth Complementary addition

Calculations Written 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

5929m 30101m

+£207.88 £771.02 111

£563.14

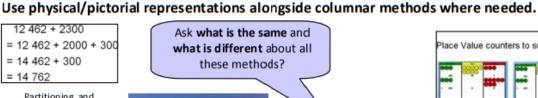
Revert to expanded methods if children find formal calculation method difficult (see Y3)

written support mental and Represent-ations to calculations

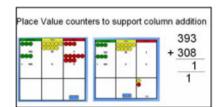
12 462 + 2300 = 12 462 + 2000 + 300

= 14 462 + 300 = 14 762

> Partitioning and recombining



Jottings to support mental calculation

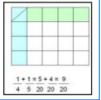


Fractions

 Add fractions with the same denominator and denominators that are multiples of the same number (to become fluent through a variety of increasingly complex problems and add fractions that exceed 1 as a mixed number)

1 + 3 = 2 + 3 = 5 $\overline{4}$ $\overline{4}$ 4



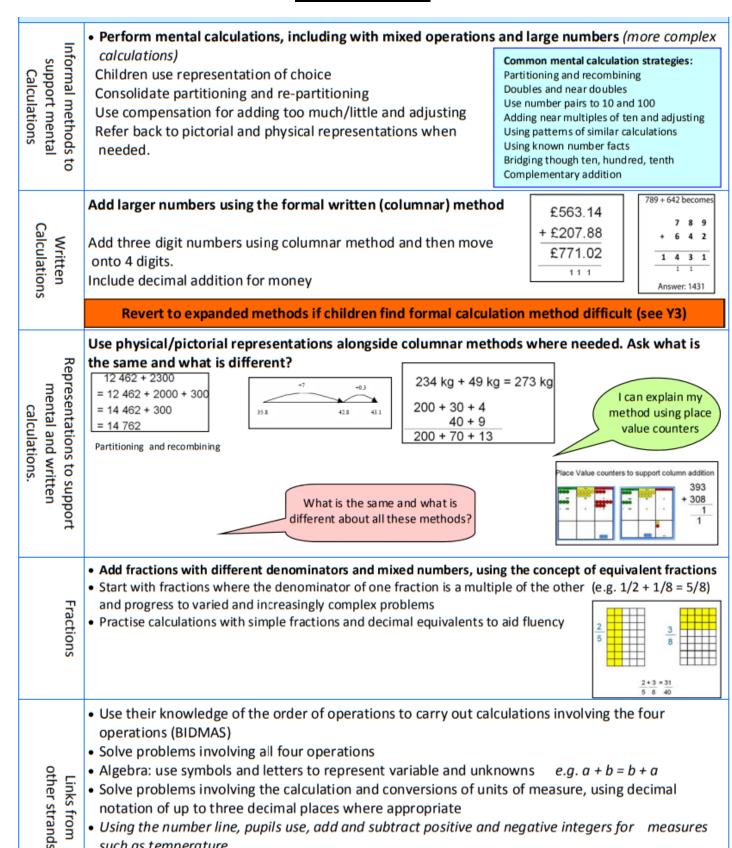


other strands Links from

- 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

<u> Year 6</u>

Addition



Using the number line, pupils use, add and subtract positive and negative integers for measures

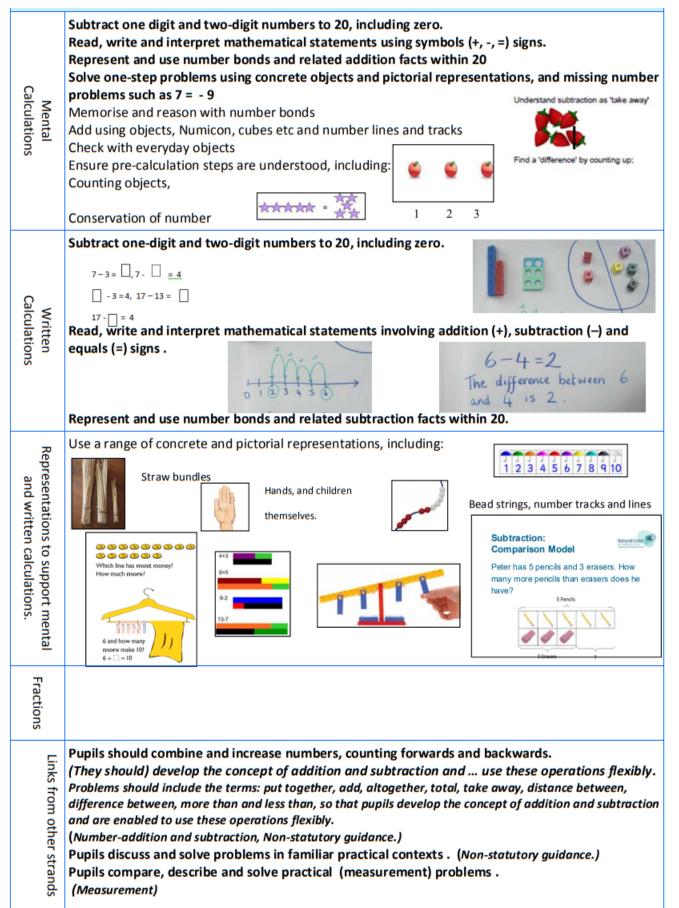
• Interpret and construct pie charts and line graphs and use these to solve problems • Find missing angles, and express geometry relationships algebraically (e.g. d=2xr)

such as temperature

Calculate and interpret the mean as an average

Year I

Subtraction



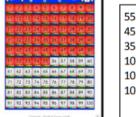
<u> Year 2</u>

Subtraction

Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: · a two-digit number and ones a two-digit number and tens 11 12 13 14 15 16 17 18 19 20 Calculations **3 24 25 26 27 28 29 30** two two-digit numbers Mental adding three one-digit numbers Jottings to support informal methods: 54 - 32 = 22Bridge through 10 where necessary <u>- = signs and missing numbers</u>
Continue using a range of equations as in Year 1 but with Extend to 14 + 5 = 20 - 0 Written recording: nd a small difference by counting up Calculations 37 - 12 = 37 - 10 - 2= 27 - 2+1 +2 = 25 42 Informal methods to support written subtraction calculations Practical portioning of a 2-digit number Representations to support mental The difference 00000000000000 between II 000000000000 In Year 1 leads to: and 14 is 3. 14 - 11 = 399999999 written calculations $11 + \square = 14$ 999999 Which line has most money? How much more? 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. l and Continue to use of a range of concrete and pictorial representations from Year 1—including Bar model to support understanding of difference. (See below.) Pupils should count in fractions up to 10, starting from any number and using the and equivalence on the number line (for example, 1 1/4, 1 1/2, 1 1/4, 2.) Fractions 13/4 Use concrete and pictorial models of fractions to assist with counting e.g. paper cups, plates, shapes etc. Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100. Pupils should partition numbers in different ways (for example, 23 = 20 + 3 and 23 = 10 + 13) to support subtraction.

Links from other strands

55 + 45 = 100 45 + 55 = 100



35 + 65 = 100 100-55 = 45 100 - 45 = 55100 - 35 = 65

Solve problems with addition and subtraction:

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

<u> Year 3</u>

Subtraction

Add and subtract numbers mentally, including: Use known number facts and place value to subtract ntinue as in Year 2 but with appropriate numbers e.g. – 15 = 72 *a three-digit number and ones *a three-digit number and tens 82 *a three-digit number and hundreds. Use a number line, dienes, hundred squares, two-hundred -10 Calculations squares, and similar representations, to support mental With practice, children will need to record less information an Menta calculations. (See Representations section below.) decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations such as 57 - 12, 86 - 77 or 43 - 28. Pencil and paper procedures omplementary addition 84 – 58 = 28 142 143 144 145 146 147 148 149 150 178 174 175 176 177 178 179 180 56 Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction. (1)Extended columnar -Calculations (2)Extended columnar no exchange Written with exchange: 87-58 becomes Extended method 87 - 53 = 70 + 1780 and 7 -50 + 887 = 70+17 50 and 3 30 and 4 = 34 20 + 9Partitioning and re-partitioning support the understanding of Representations to support mental and place-value. 560-280 30 + 6All of these representa-20 + 16tions still comprise the written calculations amount of 36. 10 + 26Introduce transition from concrete place value representations, (e.g. dienes Revert to concrete or straws), to pictorial – such as place value counters or money. manipulatives and expanded methods whenever difficulties arise 132 in dienes 132 in place value counters. Count up and down in tenths. Adding Fractions <u>1 + 1 + 1 = 3 = 1</u> Add and subtract fractions with the same denominator Fractions 6 6 6 6 2 within one whole. Money and calculating duration of events (with number lines.) other strands

For example: "Add and subtract amounts of money to give change, using both £ and p in practical

"Compare durations of events [for example to calculate the time taken by particular events or

Links from

contexts."

tasks]." (Measurement)

Subtraction

Wandsworth LA Calculation Policy for subtraction Year 4

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:

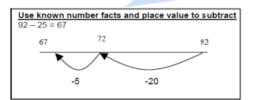
Find a small difference by counting up.

E.g. 5003-4996

- Subtract nearest multiple of ten and adjust.
- Partition larger numbers

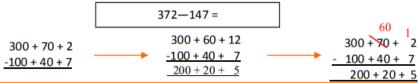
Whenever possible, children should be encouraged to visualise number lines and other basic, supporting representations to promote fluent work without jottings.

This could be done using an empty number line. Children should recall and use number facts to reduce the number of steps.



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.



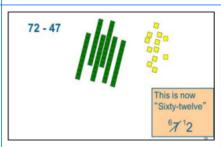
Apply understanding of subtraction with larger integers to that of decimals in context of money and measures. (See Year 5.)

Representations to support menta and written calculations.

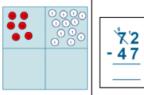
Calculations

Written Calculations

Mental



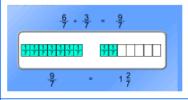
Dienes blocks or place value counters can be used to model calculations and the under-lying place value concepts.



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 number line to calculate 5003-4896; because the numbers are close together.

Fractions



Count up and down in hundredths.

Add and subtract fractions with the same denominator. Solve simple measure and money problems involving fractions and decimals to two decimal places.

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

 Subtract numbers mentally with Basic Mental Strategies for Subtraction Which method increasingly large numbers. · Find differences by counting up works best? Why? E.g. 12 462 - 2300 = 10 162 Partitioning How else could we Use rounding to check answers to · Applying known facts calculations and determine, in Calculations Bridging through 10 and multiples of 10 the context of a problem, levels of accuracy. Mental Subtracting 9, 11 etc. by compensating Pupils practise adding and subtracting ◆ Counting on to, or back from the largest number decimals, including a mix of whole numbers National Curriculum 1999 and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, 1 - 0.17 = 0.83). Children use, or visualise, representation of choice. Refer Pupils mentally add and subtract tenths, back to physical representations as required. and one-digit whole numbers and tenths. 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? Calculations Written 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? 2 What's different? 1000+700+20+14p £ 2 1734p Relate place value of decimals with that - 1000+200+10+ 6p 17.34 1216p - 1<u>2.16</u> 500+10+8p of whole numbers using representa-518p tions. See below. 5.18 Representations to support mental and written calculations. Integers Money 0 0 2 3 4 5 6 7 8 9 1 100 Decimals Use physical and pictorial representations to stress the place value relationships between money, decimals and whole numbers. A place value mat such as the this one could be used, moving away from the traditional: Hundreds, tens and ones model used in Lower KS2 and KS1. Subtract fractions with the same denominator and denominators that are multiples of the same number. Fractions (Include fractions exceeding 1 as a mixed number.) Solve problems involving number up to three decimal places. They mentally add and subtract tenths, and one-digit whole numbers and tenths. Solve problems involving addition, subtraction, multiplication and division and a combination of these, other strands Links from 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.)

<u> Year 6</u>

Subtraction

Children: 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. Calculations They undertake mental calculations with increasingly large numbers and more complex calculations. Mental Children draw on basic, Mental subtraction Strategies, (See Year 5.) Children use, or visualise, representation of choice. Refer back to physical representations as required. -0.01 -0.3 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 Calculations expanded algorithms alongside columnar methods. Ask: What is the same? What's different? Written Compare and discuss the suitability of different methods, (mental or written), in context. Revert to expanded methods whenever difficulties arise 932 - 457 becomes Consolidate columnar methods, paying particular attention to the occurrence of zeros as place holders. 7 5 2035-485 = 1552 Representations to support mental and Use physical/pictorial representations alongside columnar methods where needed. What is the same, what is different? written calculations. How long is the journey from Add and subtract fractions with different denominators and mixed numbers. Fractions They practise calculations with simple fractions and decimal fraction equivalents to aid fluency. Use their knowledge of the order of operations to carry out calculations involving the four operations other strands (BIDMAS) Links from 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.

<u>Year l</u>

Multiplication

Calculations Mental

- 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.
- Count in multiples of twos, fives and tens with equipment, songs & rhythms, and including by rote
 - Counting 2s e.g. counting socks, shoes, animal legs...
 - Counting in 5 s e.g. counting fingers, fingers in gloves, toes ...
 - · Counting in 10s e.g. counting fingers, toes ...
- Doubles up to 10
- Recognising odd and even numbers
- Write as a number pattern (e.g. 5, 10, 15...; 2, 4, 6...; 10, 20, 30...)

What comes

next?

What's the

sequence?

Calculations Written

Representations to support mental and written calculations

It is important to use a range of models to develop understanding of multiplication, and that children make connections between arrays, number patterns, and counting in twos, fives and tens

Although there is no statutory requirement for written multiplication in Year 1, it may be helpful to encourage children to begin to write it as a repeated addition sentence in preparation for Year 2

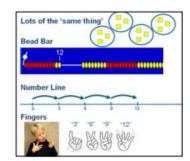
E.g. 2 + 2 + 2 + 2 = 8

Use a range of concrete and pictorial representations, including:







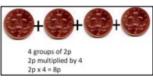


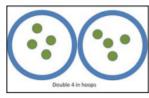


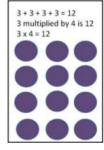
















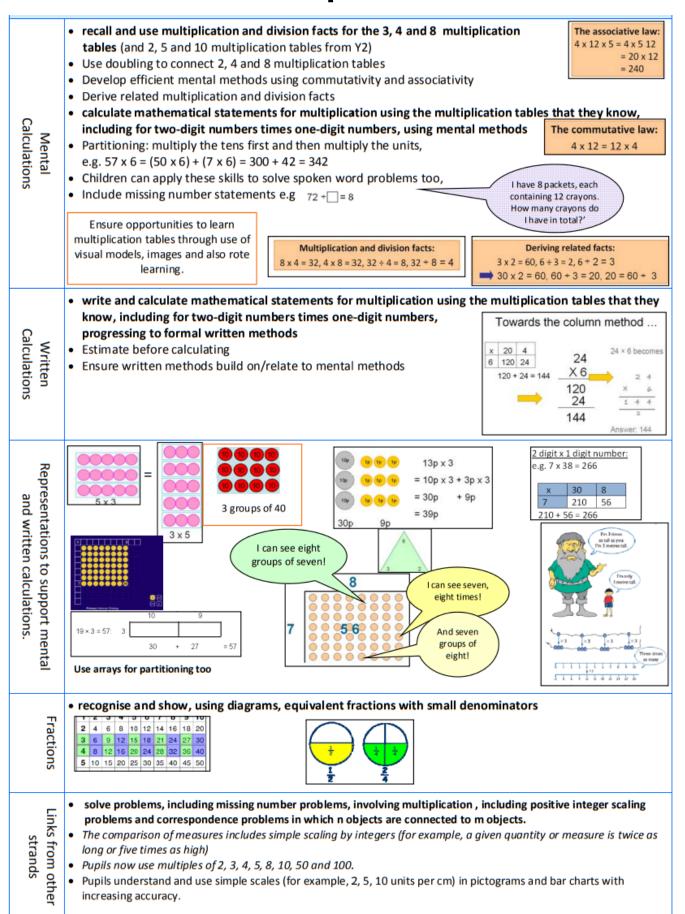
- Count in multiples of twos, fives and tens (from Number and place value), as above
- Counting in twos, five and tens from different multiples to develop their recognition of patterns in the number system
- They discuss and solve problems in familiar practical contexts, including using quantities.

Links from other strands

Multiplication

Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, connecting the 2, 5 and 10 multiplication tables to each other Connect the 10 multiplication table to place value Calculations Recognise odd and even numbers Mental I know that the show that multiplication of two numbers can be done in any order multiples of (commutative) 2/5/10 are Use a variety of language to describe multiplication and division always/never Apply doubling of numbers up to ten to doubling larger numbers calculate mathematical statements for multiplication and division within the multiplication tables and Calculations write them using the multiplication (x), division (÷) and equals (=) signs Written 7 x 2 = _ Begin to use other multiplication tables and recall facts to perform written calculations 7 x 🗀 = 14 Use a range of materials and contexts ... including arrays and repeated addition \x□= 14 Use a range of concrete and pictorial representations, including: Representations to support mental and written calculations I want Counting tally marks to five, four support counting in 5s. 10 x 6 = 60 times 3 multiplied by 5 3 multiplied by 4 What arrays can you make with 30 20 20 counters? I want four, four times five times What do you notice about the 3+3+3+3=12 numbers covered up? Is there a $3 \times 4 = 12$ pattern? What number is next? 10 5+5+5+5=4+4+4+4+4 20 8 Fractions write simple fractions for example, 1/2 of 6 = 3 and recognise the equivalence of 2/4 and 1/2 Begin to relate multiplication and division models to fractions and measures Links from other solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. strands Use commutativity and inverse relations to develop multiplicative reasoning (e.g. $4 \times 5 = 20$ and $20 \div 5 = 4$) Statistics—interpret and consttruct simple pictograms, tally charts and block diagrams Measurement - coiunting 5 minute intervals on a clock face Place value count in steps of 2, 3 and 5 from 0 and inh tens from any number, forwards and backwards

Multiplication



Year 4 Multiplication

Informal methods to support mental Calculations

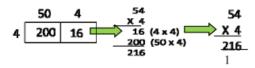
- recall multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including:
 - multiplying by 0 and 1;
 - dividing by 1;
 - multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- practise mental methods and extend this to three-digit numbers to derive facts, (for example $600 \div 3 = 200$ can be derived from $2 \times 3 = 6$)

Using the distributive law: $39 \times 7 = 30 \times 7 + 9 \times 7$ Using the associative law: $(2 \times 3) \times 4 = 2 \times (3 \times 4)$

> Using facts and rules: $2 \times 6 \times 5 = 10 \times 6 = 60$

Calculations

- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- Estimate before calculating
- Ensure written methods build on/relate to mental methods (e.g. grid method)
- · Introduce alongside grid and expanded column methods



Key skills to support:

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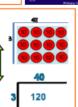
- know or quickly recall multiplication facts up to 12 × 12
- understand the effect of multiplying numbers by 10, 100 or 1000
- multiply multiples of 10, for example, 20 × 40:
- approximate, e.g. recognise that 72 × 38 is approximately 70 × 40 = 2800 and use this information to check whether their answer appears sensible

Revert to expanded methods if children find formal calculation method difficult

Representations to support menta and written calculations.

Ensure children can confidently multiply & divide by 10 and 100, that multiplying by 10 makes the number bigger and all digits move one place to the left, while dividing by 10 makes the number smaller and all the digits move one place to the right.

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



Moving digits ITP

2 0 4 8 5

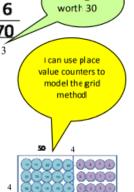
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2 0 4 8 5

Children need to understand and apply the language of multiples and factors and use it in solving multiplication and division problems, for example, 'All factors of 36 are multiples of 2, true or false? Find me two factors of 48 that are also multiples of 3.'

This digit is

worth 200



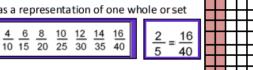
This digit is

· recognise and show, using diagrams, families of common equivalent fractions

 understand the relation between non-unit fractions and multiplication and division of quantities, with particular emphasis on tenths and hundredths.

· make connections between fractions of a length, of a shape and as a representation of one whole or set of quantities.

· use factors and multiples to recognise equivalent fractions and simplify where appropriate

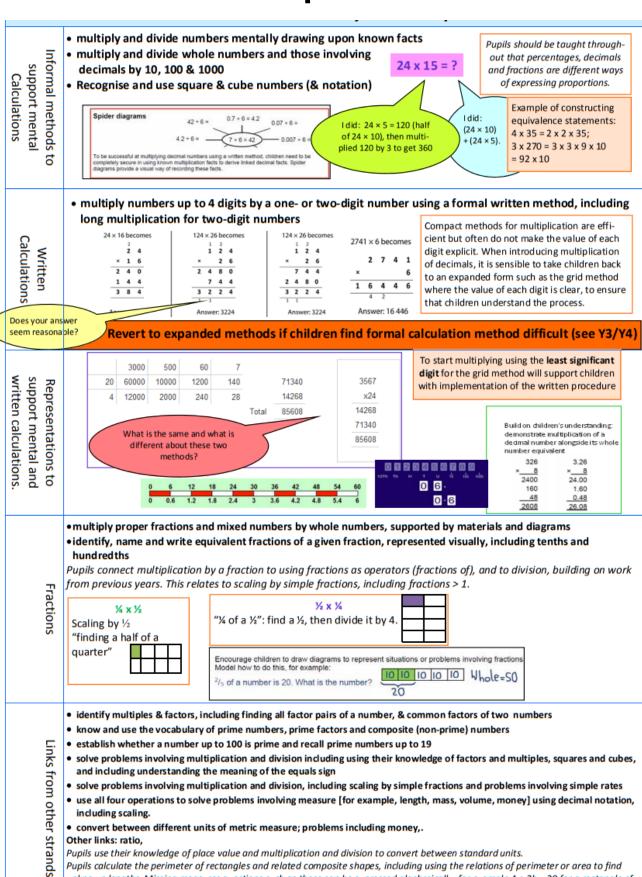


Links from other strands

Fractions

- 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
- Pupils understand and use a greater range of scales in their representations (Statistics)

Multiplication



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

 perform mental calculations, including with mixed operations and large Use mental strategies to solve problems e.g. **numbers** (increasingly large numbers & more complex calculations) x4 by doubling and doubling again use all the multiplication tables to calculate mathematical statements in x5 by x10 and halving Informal methods order to maintain fluency. x20 by x10 and doubling support mental • use estimation to check answers to calculations & determine, in the x9 by multiplying by 10 and adjusting Calculations context of a problem, an appropriate degree of accuracy. x6 by multiplying by 3 and doubling identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three How many different x/÷ facts can decimal places. you make using 72? 7.2? 0.72? Children should know the square numbers up to 12 × 12 & derive the corresponding squares of multiples of 10 e.g. $80 \times 80 = 6400$ What is the best approximation for 4.4 x 18.6? multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal 6.23 written method of long multiplication (short & long multiplication) 27 Calculations · multiply one-digit numbers with up to two decimal places by whole numbers Written 43.61 124.60 168.21 Revert to expanded methods if children find formal calculation method difficult (see Y4/Y5) Look at long-multiplication calculations 8.46 0.4 0.06 written calculations support mental and Representations to containing errors, identify the errors and 11 88 4.4 0.66 = 93.06 X 11 determine how they should be corrected 93.06 What's the same? What's different? × 3 b •multiply simple pairs of proper fractions, writing the answer in its simplest form e.g. 1/2 x 1/2 Three key applications of understanding: Pupils should use a variety of images to support their under-•Recognise that ¼ of 12, ¼ x 12 and 12 divided by 4 Fractions are equivalent standing of multiplication with fractions. This follows earlier work •Use cancellation to simplify the product of a fraction about fractions as operators and an integer e.g. % x 15 = 3, % x 15 = 2 x % x 15 = To calculate ¼ x ½ , find ½ of a rectangle/array, then divide that ½ into ¼s. So ¼ of ½ is 1/8 (fractions of), as numbers, and as 2x3 = 6equal parts of objects, e.g. as Work out how many ½s in 15, how many ¾s in 15, parts of a rectangle. how many 2/5s in 1 etc. 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 Links from other strands • explore the order of operations using brackets; for example, $2 + 1 \times 3 = 5$ and $(2 + 1) \times 3 = 9$. • 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

<u>Year l</u>

Division

Calculations Mental

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.

(Pupils) make connections between arrays, number patterns, and counting in twos, fives and tens.

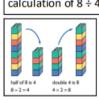


Count on or back in 2s, 5s and 10s and look for patterns.

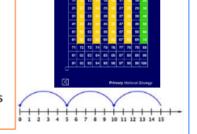
Songs are useful for counting in steps.



Pictorial jottings to support the calculation of 8 ÷ 4 Calculations Written



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.

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 2 people?"



Here, the cakes are placed in an array formation.

How many 2 tiles can we fit on the 6



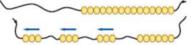
Moving from concrete to pictorial, counters represent the cakes to reinforce the relationship between multiplication and division.

Manipulatives, and real-life objects to support children's own recording; and understanding of grouping and the link with multiplication.



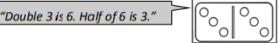


Bead strings



15 ÷ 2 using grouping model

Coat hangers and socks support calculation of 8÷2



Dominoes and dice to reinforce concepts of doubling and halving.

Fractions

Representations to support mental and written

calculations.

Recognise, find and name a half as one of two equal parts of an object, shape or quantity Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity. (See Representations above.)

Links from other strands

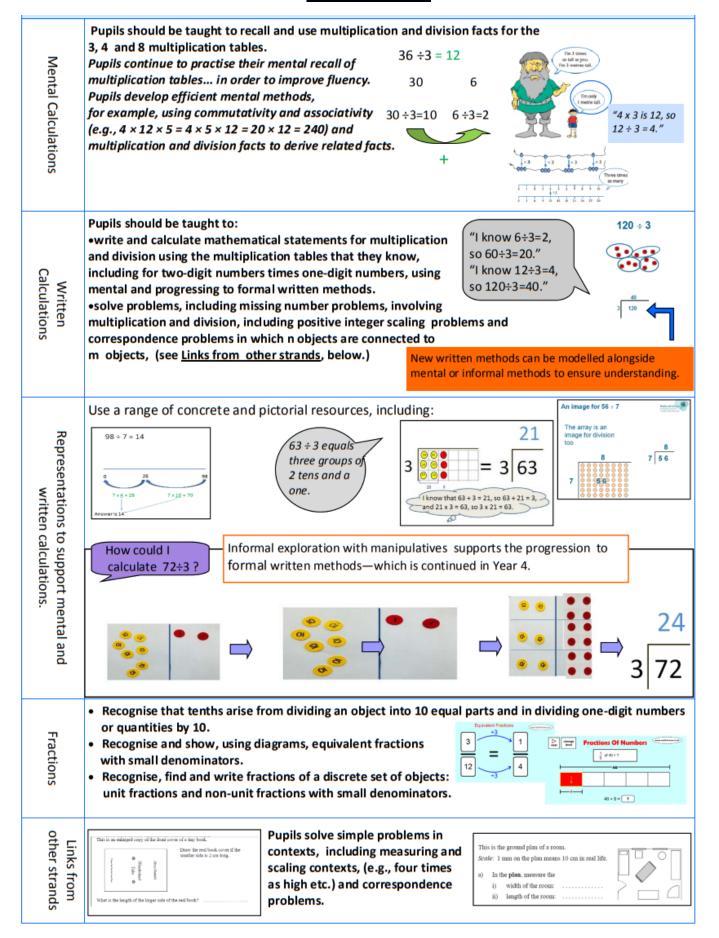
They practise counting as reciting numbers and counting as enumerating objects, and counting in twos, fives and tens from different multiples to develop their recognition of patterns in the number system (for example, odd and even numbers). (PLACE VALUE).

Pupils are taught half and quarter as 'fractions of' by solving problems using shapes, objects and quantities. (FRACTIONS)

Division

The relationship between multiplication and division must be continually considered. Calculations Recall and use multiplication and division facts for the 2, 5 and 10 Mental 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 (x), division (÷) and equals (=) signs . "5, one time", "5, two times" and so on. Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot Calculations Written Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. (See below.) ½ of 26 = 13 $26 \div 2 = 13$ Pupils decode a problem first, represent it using manipulatives and jottings; and finally record it symbolically. Use a range of concrete and pictorial representations, including: Representations to support mental and Arrays Is 14 an odd number? $2 \times 7 = 14$ $7 \times 2 = 14$ How do you know? 0000000 $14 \div 7 = 2$ 66 $14 \div 2 = 7$ 0000000 66 written calculations. **Grouping ITP** Number lines to support grouping How many groups of 5 minutes have 10p × 5 = 50p passed when the minute hand reaches twenty Representations to support multiplicative reasoning: past? Using Dienes: "If $40 \div 10 = 4$ and $30 \div 10 = 3$, what do you think 70 ÷ 10 would be? Why?" Fractions Recognise, find, name and write fractions 1/4, 1/4, 1/4, of a length, shape, set of objects or quantity Write simple fractions for example, ½ of 6 = 3 and recognise the equivalence of ½ and 2/4. Count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and Links from other strands backward. Recognise the place value of each digit in a two-digit number (tens, ones) (PLACE VALUE). Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times, (MEASURES).

Division



Division

Informal methods to support mental Calculations

Pupils should be taught to:

- 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



I know that

 $6 \div 3 = 2$, so

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

Written Calculations

Representations to support mental and written

calculations.

Pupils should be taught to:

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

Revert to expanded methods if children find formal calculation method difficult $693 \div 3$ By working through larger $492 \div 4$ 2 1 3 2 3 number calculations with 3 manipulatives, children gain experience of exchange (re-partitioning) within division algorithms. Children can work in pairs: child A constructs the array (dividing By the end of Year 4, children need to have encountered manipulatives into 3 rows), child remainders in a number of contexts. Pupils can be introduced to B checks it and records this in a remainders using known facts: e.g. 13÷4; and then progress to formal, short division format. larger numbers. (See below). $200 \div 6 = 33 \text{ r.2}$ 00000000 Remainder 2 0000000000 Money can be used instead of place value counters.

Pupils should be taught to:

 recognise and show, using diagrams, families of common equivalent fractions

- recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.
- solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number
- find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths

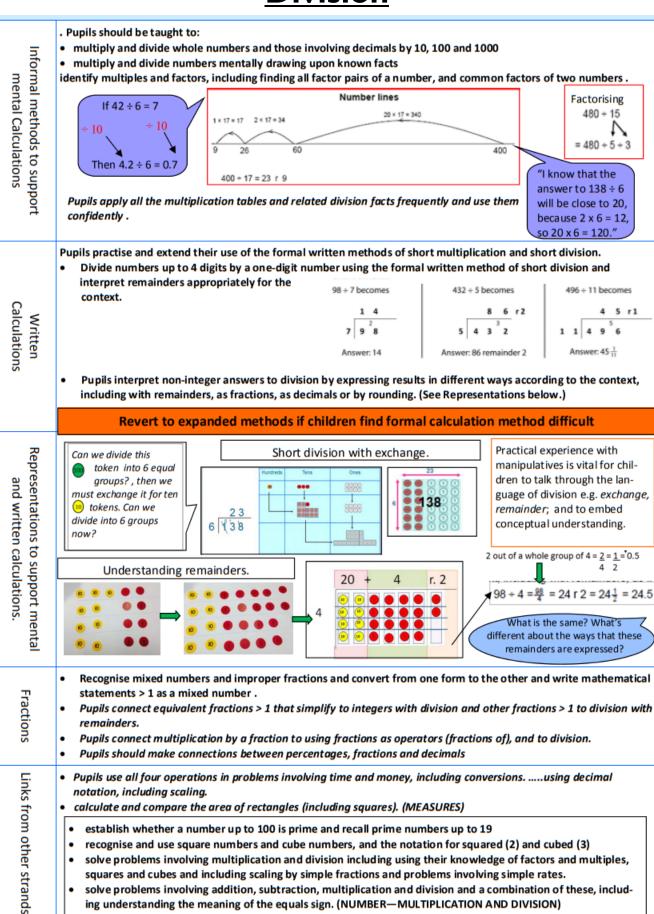
Links from other strands

Fractions

- 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 hundreths arise when dividing an object by one hundred and dividing tenths by ten. (FRACTIONS)

<u> Year 5</u>

Division



solve problems involving addition, subtraction, multiplication and division and a combination of these, includ-

ing understanding the meaning of the equals sign. (NUMBER—MULTIPLICATION AND DIVISION)

Division

