Chadsmead Primary Academy
Calculation Policy
September 2018

Teaching maths at Chadsmead Primary Academy

Vision and aims

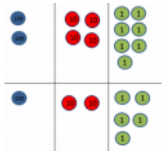
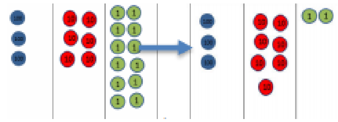
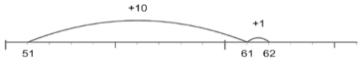
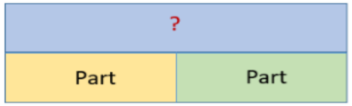
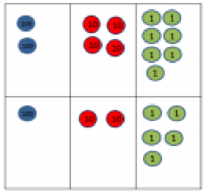
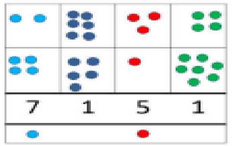
We believe that every child can succeed and achieve in maths, regardless of background, their own perceptions (and those of others) and without imposed labels categorising their maths ‘ability’. Our passion for the subject and intended success for all ensures that our learners grasp concepts through varied approaches that support calculation strategies through practical, oral and mental activities, utilising concrete apparatus and pictorial images to support ideas, and then the application of skills in real life contexts. As children begin to understand the underlying ideas they develop ways of recording to support their thinking and calculation methods, use particular methods that apply to special cases, and learn to interpret and use the signs and symbols involved. We equip learners with tools and strategies in order that they may select the most suitable approach for themselves when solving problems. Choosing the appropriate strategy, recording in mathematics (and in calculation in particular) is an important tool for furthering the understanding of ideas as well as communicating those ideas to others. A useful written method is one that helps children carry out a calculation that can be understood by others. Written methods are complementary to mental methods and should not be seen as separate from them. The aim is that learners learn to use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence.

Learners reason and explain their thoughts when tackling problems, using high level mathematical language clearly to justify the approaches they select, the thought processes they go through, as well as the solutions they reach - in many instances ‘the answer is only the beginning’. Problems are set, encouraging learners to draw on their calculations knowledge to test out ideas, make conjectures, to go up ‘dead ends’ and adjust their thinking, discussing ideas with others and being comfortable to take risks, understanding that the solution is not immediate.

We encourage our learners to accept and welcome mistakes as a step towards the eventual securing of knowledge and mastery in applying learned skills automatically in unfamiliar contexts. ‘I’m *nearly* there’ and ‘I don’t understand *yet*’ are key thoughts throughout our learning journeys. We understand that children who answer everything correctly straight away must be adequately challenged further in order to achieve their full potential.

Daily maths meetings ensure basic skills, knowledge and language in key maths areas (number, calculations, measure, shape and space, data handling) are frequently revisited. This ensures learning remains current; a frequent ‘use it or lose it’ approach to knowledge. Repeated talk and application of calculation skills to support all maths areas embeds links across the whole subject.

At Chadsmead, staff have shared ownership of and responsibility for their Calculation policy. This ensures a consistent approach to the teaching and learning of mathematics.

ADDITION Year 3	ADDITION Year 4	ADDITION Year 5	ADDITION Year 6
Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers. Partition into tens and ones Partition both numbers and recombine. Count on by partitioning the second number only e.g. 247 + 125 = 247 + 100 + 20+ 5 = 347 + 20 + 5 = 367 + 5 = 372 Children need to be secure adding multiples of 100 and 10 to any three-digit number including those that are not multiples of 10. **Written methods -** Introduce expanded column addition modelled with place value counters (Dienes could be used for those who need a less abstract representation) A number line and expanded column method may be compared next to each other. Some children may begin to use a formal columnar algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method. **Problem Solving** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.  247 +125 12 60 300 372 	Missing number/digit problems: **Mental methods** - develop, supported by a range of models and images, including the number line.  The bar model should continue to be used to help with problem solving.  **Written methods - (progressing to 4-digits)** Expanded column addition modelled with place value counters, progressing to calculations with 4-digit numbers.  200 + 40 + 7 100 + 20 + 5 300 + 60 +12 = 372 247 +125 12 60 300 372 Compact written method Extend to numbers with at least four digits.  2634 +4517 7151 Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty. Extend to two places of decimals (same number of decimals places) and adding several numbers (with different numbers of digits). 72.8 + 54.6 127.4 **Problem Solving** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.	Missing number/digit problems: **Mental methods** - continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. Children should practise with increasingly large numbers to aid fluency e.g. 12462 + 2300 = 14762 **Written methods - (progressing to more than 4-digits)** As year 4, progressing when understanding of the expanded method is secure, children will move on to the formal columnar method for whole numbers and decimal numbers as an efficient written algorithm. 172.83 + 54.68 = 227.51 Place value counters can be used alongside the columnar method to develop understanding of addition with decimal numbers. **Problem Solving** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.	Missing number/digit problems: **Mental methods** - continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. **Written methods - As year 5, progressing to larger numbers**, aiming for both conceptual understanding and procedural fluency with columnar method to be secured. Continue calculating with decimals, including those with different numbers of decimal places. Use of Y4 place value counters for SEN as needed. **Problem Solving** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

Vocabulary
Hundreds, tens, ones, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, exchange, numbers to one thousand,
Vocabulary (Mathematics Mastery)
Columnar addition, formal written methods, numeral, place holder,

Common misconceptions
*Pupils are sometimes confused that addition is associative i.e. 3+1=4 and 1+3=4. If they were to understand this concept they would find it much easier to recall the addition facts.
* If teachers use the phrase 'near multiple of ten' the children are often confused and believe that they should be multiplying a number.
* If they understand the term correctly then they might still struggle with compensating, not knowing whether to add or subtract. E.g. 46+19 =
46+20 -1 often confused as
46-20 + 1
Intervention Challenge – How many ways can you make 20 by adding 3 numbers together? Demonstrate the associative rule in order to make their working more efficient.
*Demonstrate what is happening on a number line.
*Use simpler terms to describe the operation e.g. 'add ten and take one away'.

Vocabulary
add, addition, sum, more, plus, increase, sum, total, altogether, double, near double, how many more to make...? how much more? ones boundary, tens boundary, hundreds boundary, thousands boundary, tenths boundary, hundredths boundary, inverse, how many more/fewer? equals sign, is the same as, decimal (places),
Vocabulary (Mathematics Mastery)
Associative law,

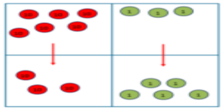
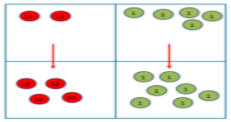
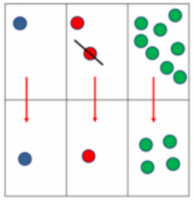
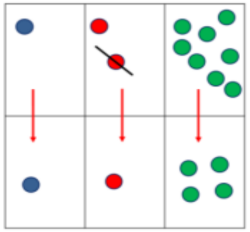
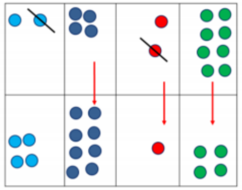
Common misconceptions
*Pupils sometimes begin adding with the left hand column first.
*Not understanding the concept of a 'carry' when a number totals more than ten, hundred etc.
e.g.
99
101 +
1910
*Pupils find it difficult to add when a zero is involved.
*They might not record a zero in an answer, leading to the following situation:
103
406 +
59
Intervention These pupils could carry out more examples using Base Ten pieces and then linking each practical step to a recorded step.
*Estimate the answer and check that their answer is similar to the estimation.
*They should realise that it means adding 'nothing'. When they have an answer of zero, they often need to be reminded to record it.

Vocabulary
tens of thousands boundary,
Also see previous years
Vocabulary (Mathematics Mastery)

Common misconceptions
*As numbers get larger, pupils miscalculate because of a lack of understanding of the place value of numbers. e.g.
1163
12123 +
23753
*Some pupils will not realise that they will have to add a 'carried' number.
Intervention Estimation – Pupils must learn to estimate – This way they will know when they have made an error.

Vocabulary
See previous years
Vocabulary (Mathematics Mastery)
Brackets, equivalent expression, numbers to ten million, order of operations,

Common misconceptions
*Unless a pupil has a good understanding of place value they will continue to make mistakes with column addition. Such errors are often dismissed as careless mistakes, when the pupil in fact has a fundamental weakness in their understanding. *When adding with decimals such weaknesses are highlighted because of the 'decimal point'.
Intervention Estimation – to see when they have made an error.
*Add numbers to one and then two decimal places to begin with. Use the example of money to teach the concept e.g.
£3.12 +
£4.15
Then extend so that a 'carry' is required.
Give the children some completed questions to mark. All questions need to be written horizontally as well as in column form. Include incorrect answers

SUBTRACTION Year 3	SUBTRACTION Year 4	SUBTRACTION Year 5	SUBTRACTION Year 6
Missing number problems e.g. □ = 43 – 27; 145 – □ = 138; 274 – 30 = □; 245 – □ = 195; 532 – 200 = □; 364 – 153 = □ **<u>Mental methods</u>** - continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving (see Y2). Children should make choices about whether to use complementary addition or counting back, depending on the numbers involved. **<u>Written methods - (progressing to 3-digits)</u>** Introduce expanded column subtraction with no decomposition, modelled with place value counters (Dienes could be used for those who need a less abstract representation)  90 8 - 30 5 60 3 For some children this will lead to exchanging, modelled using place value counters (or Dienes).  60 1 ~~70~~ 2 - 40 7 20 5 A number line and expanded column method may be compared next to each other. Some children may begin to use a formal columnar algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method. **<u>Problem Solving</u>** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.	Missing number/digit problems: 456 + □ = 710; 1□7 + 6□ = 200; 60 + 99 + □ = 340; 200 – 90 – 80 = □; 225 - □ = 150; □ – 25 = 67; 3450 – 1000 = □; □ - 2000 = 900 **<u>Mental methods</u>** - continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. **<u>Written methods - (progressing to 4-digits)</u>** Expanded column subtraction with decomposition, modelled with place value counters/dienes, progressing to calculations with 4-digit numbers. Use of squared paper to aid lining up of numbers.  20 1 200 ~~30~~ 2 - 100 10 4 100 10 8 If understanding of the expanded method is secure, children will move on to the formal method of decomposition, which again can be initially modelled with place value counters.  2 1 2~~3~~2 - 114 118 **<u>Problem Solving</u>** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.	Missing number/digit problems: 6.45 = 6 + 0.4 + □; 119 - □ = 86; 1 000 000 - □ = 999 000; 600 000 + □ + 1000 = 671 000; 12 462 – 2 300 = □ **<u>Mental methods</u>** - continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. **<u>Written methods - (progressing to more than 4-digits)</u>** When understanding of the expanded method is secure, children will move on to the formal method of decomposition, which can be initially modelled with place value counters. Expanded subtraction method 600 120 ~~700~~ ~~30~~ 14 - 200 60 7 400 60 7 = 467  5 1 2 1 ~~6~~2~~3~~2 - 4814 1418 Progress to calculating with decimals, including those with different numbers of decimal places. **<u>Problem Solving</u>** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.	Missing number/digit problems: □ and # each stand for a different number. # = 34. # + # = □ + □ + #. What is the value of □? What if # = 28? What if # = 21 10 000 000 = 9 000 100 + □ 7 – 2 x 3 = □; (7 – 2) x 3 = □; (□ - 2) x 3 = 15 **<u>Mental methods</u>** - continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. **<u>Written methods - As year 5, progressing to larger numbers</u>**, aiming for both conceptual understanding and procedural fluency with decomposition to be secured. Teachers may also choose to introduce children to other efficient written layouts which help develop conceptual understanding. For example, use of expanded subtraction: 326 -148 2(150) 150 (300) 26 (326) 178 Use of place value counters for LAPs if necessary Continue calculating with decimals, including those with different numbers of decimal places. **<u>Problem Solving</u>** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

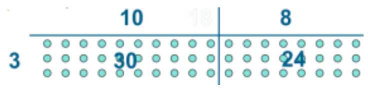
Vocabulary Hundreds, tens, ones, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, rounding, column subtraction, exchange **Vocabulary (Mathematics Mastery)** **Common misconceptions** If teachers use the phrase 'near multiple of ten' the children are often confused and believe that they should be multiplying a number. If they understand the term correctly then they might still struggle with compensating, not knowing whether to add or subtract. E.g. 46-19 = 46-20 +1 often confused as 46-20 – 1 **Intervention** Demonstrate the method on a number line. *Use simpler terms to describe the operation e.g. 'take ten away and add one'. *Encourage pupils to map out their calculations on their own number lines. This will help them to visualise what is happening and enable them to work more efficiently mentally.	**Vocabulary** add, addition, sum, more, plus, increase, sum, total, altogether, double, near double, how many more to make..? how much more? ones boundary, tens boundary, hundreds boundary, thousands boundary, tenths boundary, hundredths boundary, inverse, how many more/fewer? Equals sign, is the same as. **Vocabulary (Mathematics Mastery)** **Common misconceptions** Pupils sometimes begin subtracting with the left hand column first. *In tens and units and other formal vertical subtraction calculations, children sometimes take the smaller unit number from the larger, regardless of whether it is part of the larger or smaller number. e.g. 945 237 - 712 **Intervention** Practise using base ten materials and talk through the calculation. *Teach composition, being careful to use the correct vocabulary. Demonstrate what is happening when we decompose, on an OHP with base ten materials. Show the tens and hundreds 'moving'. *Teach composition using the expanded layout to begin with. This will help pupils who do not have a secure knowledge of place value. e.g. 64 – 28 = 50 14 20 8 –	**Vocabulary** tens of thousands boundary, **Vocabulary (Mathematics Mastery)** **Common misconceptions** Children will have been taught to use a number line and should be able to visualise this mentally. Some pupils May fail to recognise the steps they need to take and fail to add up 'the steps' at the end. *Misconceptions occur when decomposing from a 'high' number. e.g. 9000 - 3654 Some pupils will attempt subtraction calculations using the formal written method, failing to recognise that it would be more efficient to calculate the answer mentally. *Misconceptions occur when pupils (and teachers) use inaccurate language. e.g. 2367 - 1265 *When talking about 2000 – 1000 they may refer to it as 2 – 1. **Intervention** Work with number lines and 'counting up' to find a difference. *Give pupils a range of subtraction questions and ask them whether they would be better answered mentally or by a written method. *Always refer to the digits accurately i.e. 'take two hundred from three hundred'	**Vocabulary** See previous years **Vocabulary (Mathematics Mastery)** Numbers to ten million, order of operations, **Common misconceptions** Subtractions involving zeros cannot be done. *That calculations such as the following cannot be done: 34 27 – *Pupils who cannot do these have not got a sufficient understanding of exchanging. *Unless a pupil has a good understanding of place value they will continue to make mistakes with column subtraction. Such errors are often dismissed as careless mistakes, when the pupil in fact has a fundamental weakness in their understanding. When subtracting with decimals such weaknesses are highlighted because of the 'decimal point. **Intervention** Revise decomposition. If necessary, reinforce the method using base ten materials on an OHP or by using a power point presentation (such presentations can be found using a general search on the internet). *Estimation – Pupils must learn to estimate – This way they will know when they have made an error. *Subtract numbers to one and then two decimal places to begin with. Use the example of money to teach the concept e.g. £6.32 £4.11 - Then extend so that decomposition is required. *Give the children some completed questions to mark. All questions need to be written horizontally as well as in column form. Include incorrect answers.

MULTIPLICATION
Year 3

Missing number problems Continue with a range of equations as in Year 2 but with appropriate numbers.

Mental methods - Doubling 2 digit numbers using partitioning.
Demonstrating multiplication on a blank number line – jumping in larger groups of amounts Start with repeated addition 13 x 4 = 10 groups 4 = 3 groups of 4
Use of a number line to physically group (SEN) eg 10 x 4 on number line then 3x4

Written methods (progressing to 2d x 1d) Developing written methods using understanding of visual images



Develop onto the grid method

Give children opportunities for children to explore this and deepen understanding using Dienes apparatus and place value counters

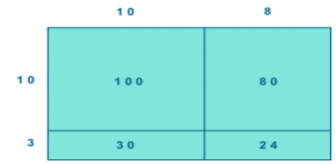
Problem Solving ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

MULTIPLICATION
Year 4

Continue with a range of equations as in Year 2 but with appropriate numbers. Also include equations with missing digits □2 x 5 = 160

Mental methods - Counting in multiples of 6, 7, 9, 25 and 1000, and steps of 1/100.
Solving practical problems where children need to scale up.
Relate to known number facts. (e.g. how tall would a 25cm sunflower be if it grew 6 times taller?)

Written methods (progressing to 3d x 2d)
Children to embed and deepen their understanding of the grid method to multiply up 2d x 2d.
Ensure this is still linked back to their understanding of arrays and place value counters.



Year 4 HAP / G&T
18
x 13
180 (10 x 18)
30 (10 x 3)
24 (8 x 3)
234

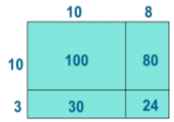
Problem Solving ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

MULTIPLICATION
Year 5

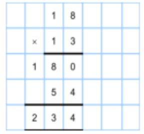
Continue with a range of equations as in Year 2 but with appropriate numbers.
Also include equations with missing digits

Mental methods - X by 10, 100, 1000 using moving digits ITP Use practical resources and jottings to explore equivalent statements (e.g. 4 x 35 = 2 x 2 x 35)
Recall of prime numbers up 19 and identify prime numbers up to 100 (with reasoning)
Solving practical problems where children need to scale up.
Relate to known number facts.
Identify factor pairs for numbers

Written methods (progressing to 4d x 2d)
Long multiplication using place value counters
Children to explore how the grid method supports an understanding of long multiplication (for 2d x 2d)



Secure grid multiplication needed before long multiplication method used.



Problem Solving ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

MULTIPLICATION
Year 6

Continue with a range of equations as in Year 2 but with appropriate numbers. Also include equations with missing digits.

Mental methods - Identifying common factors and multiples of given numbers

Solving practical problems where children need to scale up. Relate to known number facts.

Written methods - Continue to refine and deepen understanding of written methods including fluency for using long multiplication.

MAPs / LAPS

X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

2 3 1
1 3 4 2
x 1 8
1 3 4 2 0
1 0 7 3 6
2 4 1 5 6
1

Problem Solving ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

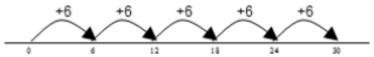
Vocabulary Partition, grid method, inverse **Vocabulary (Mathematics Mastery)** Product, multiples of four, eight, fifty and one hundred, scale up **Common misconceptions** See Year 4/5 **Intervention** See Year 4/5 Children may need to go back to multiplication as an array, or repeated addition, to gain security with the notion of multiplication.	**Vocabulary** Factor, Multiplication facts (up to 12x12), division facts, inverse, derive **Vocabulary (Mathematics Mastery)** Multiplication facts (up to 12x12), division facts, inverse, derive **Common misconceptions** See Year 5 **Intervention** See Year 5 Play 'Round the World'; One child stands behind the chair of another, the only 2 that can answer a question given. Should the standing child answer first, then move to next chair – aiming to get around the whole class (the world) Should the seated child answer first, then swap places and continue.	**Vocabulary** cube numbers, prime numbers, square numbers, common factors prime number, prime factors composite numbers **Vocabulary (Mathematics Mastery)** Efficient written method, factor pairs, composite numbers, prime number, prime factors, square number, cubed number, formal written method **Common misconceptions** Not understanding that x10 and x 10 again, is the same as x100. 'Add a zero' = limited understanding. *Not understanding 'lots of' and 'groups of' meaning the same. *Children are introduced to formal written methods before they fully understand the concept, so it becomes a test of their memory to remember the 'rule'. No strategies to rely upon when they are 'stuck'. *Problems with place value can cause difficulties with written work. **Intervention** Label chairs TH, H, T, U - choose children to sit, holding a digit card. When multiplying by 10/100/1000, the children move required no' of spaces along chairs. Additional children will be needed holding 'zero' cards as spare chairs become available from the units. Question pupils as to their value, what value do they have now they've moved? How many times larger are they? *Find links between tables. *Use a multiplication grid and complete the easier questions. *Learn the square numbers (4x4, 5x5 etc…) All of the tables can be reduced to just a few facts. *Games requiring tables knowledge. *When introducing multiplication with larger numbers, revert back to a learned written method. Move to a more formal method when secure. *Partition numbers and deal with them in parts (grid method). Some children won't advance written methods beyond this. *Count multiples of a number along counting sticks, then the corresponding multiples e.g. 3,6, 9 30,60,90 0.3,0.6,0.9	**Vocabulary** See previous years common factor **Vocabulary (Mathematics Mastery)** Common factors, common multiples **Common misconceptions** Misunderstanding the concept of making a number 10/100/1000 times bigger, prefer to learn 'add a zero'. *Causes difficulties when working with decimal numbers and fractions. *Children ignore decimal point, perform calculation, then 'count how many digits after the point'. Effective shortcut, but difficulty when applying to mental work – encourage 'why does it work?' *Children introduced to formal written strategy too early, when 'stuck' reach for a calculator because have no strategy of their own. *Place value errors when performing written calculations can cause problems for even able pupils. *Children are taught to multiply single digits and count the number of zeros. 20 x 50 = 100 is a common mistake as children don't know what to do with the 'extra' zero **Intervention** See year 5 Chair activity. *Encourage the children to approximate first, e.g. 4.92 x3.1 is approx. 5 x 3, so answer should be approx. 15. Start with mental strategies first…25 x 0.4 is 10 times smaller than 25 x 4, i.e. 10 times smaller than 100, = 10. *Use the 'grid method' (See supplement of examples in NNS) as it is based upon partitioning, with which the pupils will be extremely familiar. It is worth showing the pupils practically, with cubes, that multiplying the parts is the same as multiplying by the whole number in one step *Use 20 x 5 as a key fact and then extend to 20 x 50 which is 10x bigger. Twenty times five is one hundred Twenty times fifty is one thousand Write the connected number sentences one above the other, 20 x 5 = 100 20 x 50 = 1000

DIVISION — Year 3

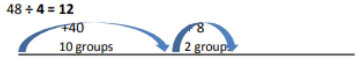
÷ = signs and missing numbers.

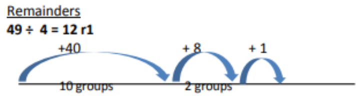
Continue using a range of equations as in year 2 but with appropriate numbers.

SEN LAPs share objects with concrete materials first.
Grouping - How many 6's are in 30? 30 ÷ 6 can be modelled as:



Becoming more efficient using a number line. Children need to be able to partition the dividend in different ways.





Sharing – 49 shared between 4. How many left over?
Grouping – How many 4s make 49. How many are left over?

Place value counters can be used to support children apply their knowledge of grouping. For example: 60 ÷ 10 = How many groups of 10 in 60? 600 ÷ 100 = How many groups of 100 in 600?

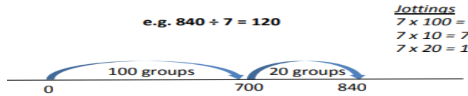
Problem Solving ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

DIVISION — Year 4 / Year 5

÷ = signs and missing numbers Continue using a range of equations as in year 3 but with appropriate numbers.
Sharing, Grouping and using a number line Children will continue to explore division as sharing and grouping, and to represent calculations on a number line until they have a secure understanding.
Children should progress in their use of written division calculations: using tables facts with which they are fluent; experiencing a logical progression in the numbers they use, for example:

1. Dividend just over 10x the divisor, e.g. 84 ÷ 7
2. Dividend just over 10x the divisor when the divisor is a teen number, e.g. 173 ÷ 15 (learning sensible strategies for calculations such as 102 ÷ 17)
3. Dividend over 100x the divisor, e.g. 840 ÷ 7
4. Dividend over 20x the divisor, e.g. 168 ÷ 7

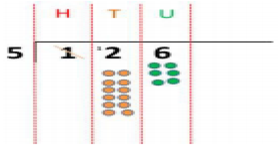
All of the above stages should include calculations with remainders as well as without. Remainders should be interpreted according to the context. (i.e. rounded up or down to relate to the answer to the problem)



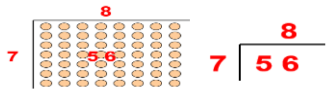
DIVISION — Year 4

Written methods - Formal short division should only be introduced once children have a good understanding of division, its links with multiplication and the idea of counting up to find a target number (see use of number lines above)

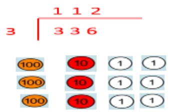
Short division to be modelled for understanding using place value counters as shown below. Calculations with 2 and 3-digit dividends. E.g. fig 1



Alongside pictorial representations and the use of models and images, children should progress onto short division using a bus stop method



Place value counters to support knowledge of grouping. Reference should be made to the value of each digit in the dividend.

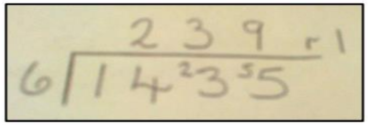


Each digit as a multiple of the divisor
'How many groups of 3 are there in the hundreds column?'
'How many groups of 3 are there in the tens column?'
'How many groups of 3 are there in the units/ones column?'

DIVISION — Year 5

Written methods - Continued as shown in Year 4, leading to the efficient use of a formal method.

The language of grouping to be used (see link from fig. 1 in Year 4) E.g. 1435 ÷ 6



Children begin to practically develop their understanding of how express the remainder as a decimal or a fraction.

Ensure practical understanding allows children to work through this (e.g. what could I do with this remaining 1? How could I share this between 6 as well?)

Problem Solving ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

DIVISION — Year 6

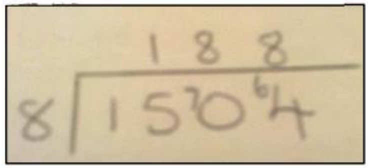
÷ = signs and missing numbers Continue using a range of equations but with appropriate numbers

Sharing and Grouping and using a number line (SEN)

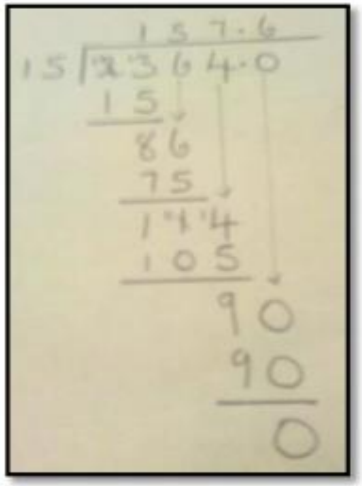
Children will continue to explore division as sharing and grouping, and to represent calculations on a number line as appropriate.

Quotients should be expressed as decimals and fractions

Written methods – long and short division E.g. 1504 ÷ 8



E.g. 2364 ÷ 15



Problem Solving ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding.

Vocabulary See Y1 and Y2 Inverse **Vocabulary (Mathematics Mastery)** Product, multiples of four, eight, fifty and one hundred, scale up **Common misconceptions** Children not see link between the two operations, need more experience of chunking, as well as sharing. Need to be taught alongside each other – not separately. Children think that 2 ÷ 4 is the same as 4 ÷ 2. **Intervention** Show children physically that 2 ÷ 4 cannot be the same as 4 ÷ 2… use a 2m length of wool, cut into 4 equal pieces. Use a 4m length of wool, cut into 2 pieces – are they the same? *Lots of examples using cubes to show that multiplication and division are the inverse of each other. *When teaching the chunking written method, model with cubes every step of the written process.	When children have conceptual understanding and fluency using the bus stop method without remainders, progress onto 'carrying' their remainder across to the next digit. **Problem Solving** ensure pupils have opportunities to apply knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen understanding. **Vocabulary** see years 1-3, divide, divided by, divisible by, divided into share between, groups of, factor, factor pair, multiple times as (big, long, wide …etc) equals, remainder, quotient, divisor inverse **Vocabulary (Mathematics Mastery)** **Common misconceptions** Not understanding that division is grouping as well as sharing. *Lack of tables knowledge. *Not understand the concept of 'inverse'. *Not understanding what the remainder represents, need to see calculation in concrete way (cubes left over after division_ *Ignoring the context of questions - should remainder be rounded up or down? **Intervention** Practise repeating multiplication tables, games such as 'round the world' (see Year 6). *Show the pupils, physically, that 'groups of' (multiplication) and division are the same, using cubes. *Use multiplication grid for 'facts', so not slowing down division process. *Practical examples where children need to put objects in boxes (egg boxes good), alongside written form of the division question.	**Vocabulary** see year 4 common factors, prime number, prime factors, composite numbers, short division, square number, cube number inverse, power of **Vocabulary (Mathematics Mastery)** Efficient written method, Factor pairs, composite numbers, prime number, prime factors, square number, cubed number, formal written method **Common misconceptions** Pupils do not understand that ÷ 10 and then ÷ 10 again, is the same as ÷ 100. See Year 6 *Pupils are introduced to written method before fully understanding the concept of grouping or 'chunking'. *Need more concrete examples. *When dealing with remainders, pupils have little understanding of how to represent as a fraction or a decimal. **Intervention** Label chairs TH, H, T, U and choose children to sit, holding a digit card. When dividing by 10/100/1000, the children move required no. spaces along chairs. Child as zero units 'drops off' end. NOTE; only used when units digit is zero. Question pupils as to their value, what value do they have now they have moved seats? How many times smaller are you? *Ensure that the pupils relate the division to multiplication; 27÷3 … 'how many chunks of 3 are there in 27?' *Count up in 3s. Less able children use a tables square for multiplication facts, so not to slow down understanding of the division process.	**Vocabulary** see years 4 and 5 **Vocabulary (Mathematics Mastery)** Common factors, common multiples **Common misconceptions** Lack of understanding that division is grouping as well as sharing. *Lack of tables knowledge. *Ignore decimal point when calculating, then simply 'slot back in'. *Comes from over generalisation of adding decimals. (inc. above) *Misunderstand the concept of making a no. 10/100/1000 times smaller, prefer to learn 'knock off a zero'. *When the no. ends in a different digit, simply knock that off. Ignore decimal point, or 'move it' - often taught by parents! **Intervention** Lots of activities requiring constant repetition of tables, play 'Round the World'; One child stands behind the chair of another, the only 2 that can answer a question given. Should the standing child answer first, then move to next chair – aiming to get around the whole class (the world) Should the seated child answer first, then swap places and continue. *See Year 5. *When operating with decimal numbers, and whole numbers where units digit is not zero, choose another child to sit and hold the 'decimal point' card. They will NEVER move! *Additional chairs will be required for the tenths, hundredths columns.