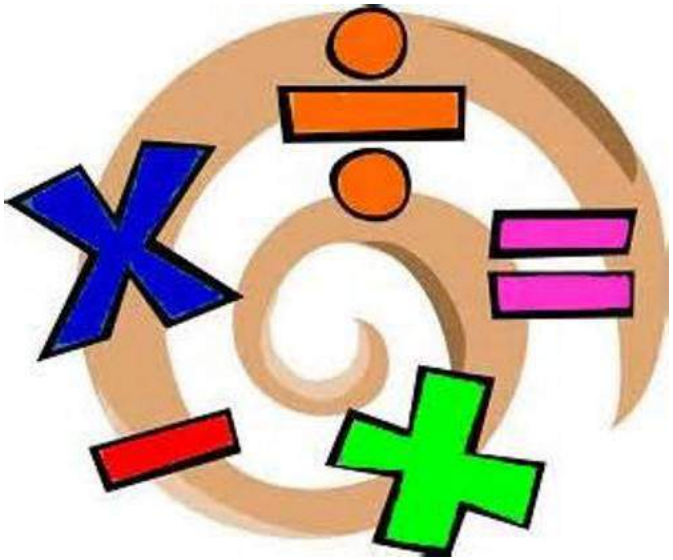
Grangetown Primary School *Enjoy-Respect-Achieve*

Calculation Policy



Addition

Aims:

- Children are taught and acquire secure mental methods of calculation.
- Children are taught one efficient written method of calculation for addition which they know and can rely on when mental methods are not appropriate.
- Mental and written methods of calculation should be applied frequently to relevant problem-solving contexts.

To add successfully, children need to be able to:

- Recall all addition pairs to 10+10
- Add mentally a series of one-digit numbers: 5+5+4
- Use addition facts and their knowledge of place value to:
  - Add multiples of 10: 60+70
  - Add multiples of 100: 600+700

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for calculation.

Subtraction

Aims:

- Children are taught and acquire secure mental methods of calculation.
- Children are taught one efficient written method of calculation for subtraction which they know and can rely on when mental methods are not appropriate.
- **Mental and written methods of calculation should be applied frequently to relevant problem-solving contexts.**

To subtract successfully, children need to be able to:

- Recall all addition and subtraction facts to 20
- Use subtraction facts and their knowledge of place value to:
- Subtract multiples of 10: 160-70 (subtraction fact: 16-7)
- Partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways: e.g. partition 74 into 70+4 or 60+14

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for calculation.

Multiplication

Aims:

- Children are taught and acquire secure mental methods of calculation.
- Children are taught one efficient written method of calculation for multiplication which they know and can rely on when mental methods are not appropriate.
- Mental and written methods of calculation will be be applied frequently to relevant problem-solving contexts.

To multiply successfully, children need to be able to:

- Recall all multiplication facts to 12 x 12
- Partition numbers into multiples of one hundred, ten and one
- Work our products such as 70 x 5, 70 x 50, 700 x 5 or 700 x 50 using the related fact 7 x 5 and their knowledge of place value
- Add two or more single-digit numbers mentally
- Add multiples of 10 (such as 60 + 70) or of 100 (such as 600 + 700) using the related addition fact, 6 + 7, and their knowledge of place value
- Add combinations of whole numbers using the column method.

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for calculation.

The stages build up to using an efficient method for:

- Multiply two-digit numbers by a one-digit number by the end of Year 3
- Multiply two-digit and three-digit numbers by a one-digit number using a formal written method by the end of Year 4
- Multiplying numbers up to four-digits by a one or two-digit number using a formal written method, including long multiplication by the end of Year 5
- Multiplying numbers with at least four-digits by two-digits using long multiplication by the end of Year 6

Multiplication facts:

Year 2: 2 times table
5 times table
10 times table

Year 3: 2 times table
3 times table
4 times table
5 times table
8 times table
10 times table

Year 4, 5 & 6: Derive and recall all multiplication facts up to 12 x 12.

Division

Aims:

- Children are taught and acquire secure mental methods of calculation.
- Children are taught one efficient written method of calculation for division which they know and can rely on when mental methods are not appropriate.
- Mental and written methods of calculation should be applied frequently to relevant problem-solving contexts.

To divide successfully in their heads, children need to be able to:

- understand and use the vocabulary of division – for example in 18 ÷ 3 = 6, the 18 is the dividend, the 3 is the divisor and the 6 is the quotient;
- partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways;
- recall multiplication and division facts to 12 × 12 recognise multiples of one-digit numbers and divide multiples of 10 or 100 by a single-digit number using their knowledge of division facts and place value;
- know how to find a remainder working mentally – for example, find the remainder when 48 is divided by 5;
- understand and use multiplication and division as inverse operations.

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for division.

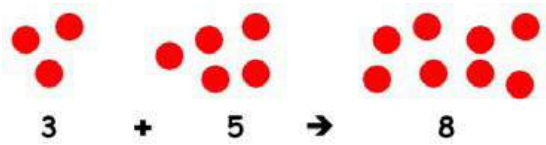
To carry out written methods of division successful, children also need to be able to:

- understand division as repeated subtraction;
- estimate how many times one number divides into another – for example, how many sixes there are in 47, or how many 23s there are in 92;
- multiply a two-digit number by a single-digit number mentally;
- subtract numbers using the column method.

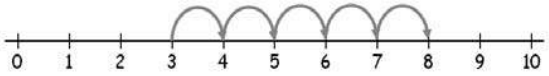
Early Recording of Division

- Division will be related to multiplication through the use of models and images and associated language.

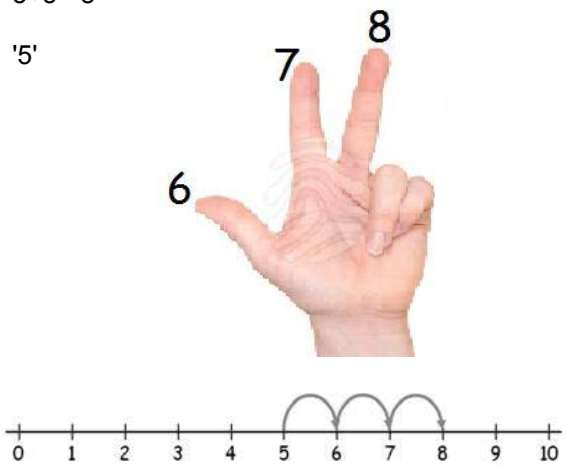
Addition

Addition Stage 1: Count all	Example of Written Method	Foundation Stage – Early Learning Goals
Mental method: Count out the groups, then find the total by counting all the counters **Practise:** Use practical resources in playful and relevant context.	**3 + 5 = 8**  3 + 5 → 8	**Foundation Stage- Early Learning Goal** • Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. • Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. • They solve problems, including doubling, halving and sharing.

Addition

Stage 2: Count on from the first number	Example of Written Method	Foundation Stage – Early Learning Goals
Mental method: Verbally 'say' the first number, and then use fingers to count on. Demonstrate on a number line. **Practise:** Practise addition strategy in playful situations and relevant contexts Number bonds to 10 Doubles to 5 (Double 1, 2, 3, 4, 5) Estimating the answer	**3+5=8** **'3'**  	**Foundation Stage Continued**

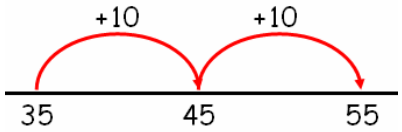
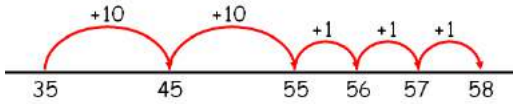
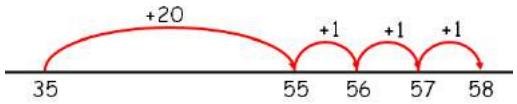
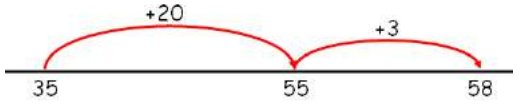
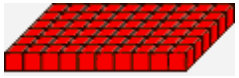
Addition

Stage 3: Count on from the larger number	Example of written method	Year 1- Addition and subtraction
Mental method: Children decide which number is the largest, verbally 'say' this number, and use fingers to count on. Demonstrate on a number line. **Written method:** Write the number sentence. **Practise:** Use practical resources in playful and relevant context, e.g. • Snack time • Tidy-up time • Registration • Play activities Number bonds up to 20 Doubles up to 10 Estimating the answer	5+3 =8 '5'  **Include addition of 1 and 2 digit numbers to 20:** 9+9= 18 **Add three 1-digit numbers:** 5+3+4=12	Pupils should be taught to: • read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately • add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero • represent and use number bonds and related subtraction facts within 20 • solve simple word problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems. Notes and Guidance: • Pupils should memorise and reasons with number bonds to 10 and 20 in several forms (e.g. 9 + 7 = 16; 16-7 =9; 7 = 16-9). They should realise the effect of adding or subtracting zero. • Pupils should combine and increase numbers, counting forwards and backwards. • They should 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, more than and less than so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly. • Children should be able to add a multiple of 10 to a one-digit number • Near doubles Range of vocabulary: Put together Add Altogether Total more than

Addition

Stage 4: Addition on a hundred square	Example of written method	Year 1- Addition and subtraction
Mental method: Introduce a hundred square when the second number is larger than 10. Count on 2 tens then 3 ones. **Written method:** Write the number sentence **Practise:** Number bonds up to 20 Estimating the answer Relevant problem solving opportunities	35+23=58 	Pupils should be taught to: • read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately • add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero • represent and use number bonds and related subtraction facts within 20 • solve simple one-step word problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems. Notes and Guidance: • Pupils should memorise and reasons with number bonds to 10 and 20 in several forms (e.g. 9 + 7 = 16; 16-7 =9; 7 = 16-9). They should realise the effect of adding or subtracting zero. • Pupils should combine and increase numbers, counting forwards and backwards. • They should 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, more than and less than so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.

Addition

Stage 5: Counting on using a number line	Example of written method	Year 2 - Addition and subtraction
Mental method: Partitioning- adding the tens and ones separately **Written method:** Steps in addition can be recorded on a number line. The steps often bridge through a multiple of 10. Number line helps record the steps on the way to calculating the total. Extend to column addition without **Practise:** Use Dienes apparatus Estimating the answer Relevant problem solving opportunities	35+20=55  35+23=58    **Column addition (without carrying):** **TO - O** 1 2 + 5 1 7 	Pupils should be taught to: • Solve simple one-step problems with addition and subtraction: * using concrete objects and pictorial representations, including those involving numbers, quantities and measures * applying their increasing knowledge of mental and written methods • recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 • add and subtract numbers using concrete objects, pictorial representations, and mentally, including: * a two-digit number and ones * a two-digit number and tens * two two-digit numbers • adding three one-digit numbers show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. Notes and Guidance: • Pupils should extend their understanding of the language of addition and subtraction to include sum and difference. • Pupils should practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using 3 + 7 = 10, 10 – 7 = 3 and 7 = 10 – 3 to calculate 30 + 70 = 100, 100 -70 = 30 and 70 = 100 – 30. They should check their calculations, including by adding to check subtraction and adding numbers in a different order to check addition (e.g. 5 + 2 + 1 = 1 + 5 + 2 + 1+ 2 + 5). • Recording addition and subtraction in columns supports place value and prepares for efficient written methods with larger numbers.

Addition

Stage 6: Partitioning leading to column addition	Example of written method	Year 3 - Addition and subtraction
Mental method: Step 1: Add the tens then the ones to form partial sums Step 2: Add the partial sums **Written method:** Record steps in addition using partitioning. Progress to column addition. **Practise:** Estimating the answer Relevant problem solving opportunities	18 + 15 = 33 10+10 = 20 8 + 5 = 13 20 + 13 = 33 35+23=58 30+20 = 50 5+ 3 = 8 50 + 8 = 58 **Column addition up to 3 digits:** TO + TO 24 + 15 = 39 HTO + TO 126 + 33 = 159 HTO + TO 237 + 516 = 293	Pupils should be taught to: • add and subtract numbers mentally, including: * a three-digit number and ones * a three-digit number and tens • a three-digit number and hundreds • add and subtract numbers with up to three digits, using the efficient written methods of columnar addition and subtraction • estimate the answer to a calculation and use inverse operations to check answers • solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. Notes and Guidance: • Pupils should practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100. • Pupils should use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent.

Addition

Stage 7: Column addition	Example of written method	Year 4 - Addition and subtraction
Mental method: Step 1: Put the largest number first Step 2: Add the tens Step 3: Add the ones **Written method:** Extend column addition up to 4 digits. **Practise:** Estimating the answer Relevant problem solving opportunities	**Column addition with up to 4 digits.** THHTO + THHTO 2 4 3 5 + 3 1 6 5 1 9 6 0 9 4	Pupils should be taught to: • add and subtract numbers with up to 4 digits using the efficient written methods of columnar addition and subtraction where appropriate • estimate and use inverse operations to check answers to a calculation • solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. Notes and Guidance: • Pupils should continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.

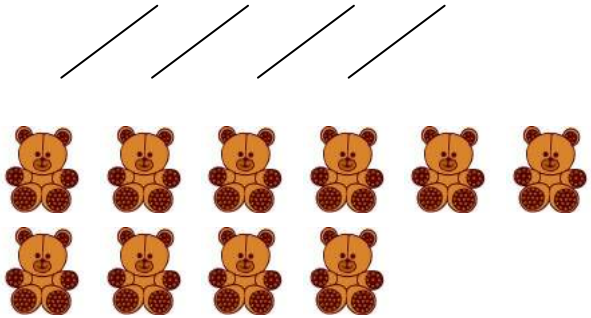
Addition

Stage 8: Extend column addition	Example of written method	Year 5 - Addition and subtraction
Mental method: Children place numbers in columns, drawing on their understanding of place value. **Written method:** Column addition remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable. Carry digits are recorded on the line, using the words: 'carry ten' or 'carry one hundred', not 'carry one'. Continue to add numbers with up to 5 digits. **Practise:** Estimating the answer Relevant problem solving opportunities.	**Column addition with 5 digits:** TThThHTO + ThHTO 1 5 3 6 2 + 2 3 4 1 5 6 3 8 8 1 8 **Column addition with decimals:** TO.t + TO.t 5 6 . 3 + 2 . 6 5 8 . 9	Pupils should be taught to: • add and subtract whole numbers with more than 4 digits, including using efficient written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers • use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. Notes and Guidance: • Pupils should practise using the efficient written methods of columnar addition and subtraction with increasingly large numbers to aid fluency. • They should practise mental calculations with increasingly large numbers to aid fluency (e.g. 12 462 – 2 300 = 10 162).

Addition

Stage 9: Continue to practise and apply skills	Example of written method	Year 6 - Addition and subtraction
Mental method: Children should be able to perform mental calculations, including with mixed operations and large numbers. **Written method:** Column addition involving larger numbers. **Practise:** Children should apply the formal written method to word and real-life problems.	**Use column addition in problem solving contexts.** **Continue to practise column addition and extend to large numbers when appropriate:** TThThHTO + ThHTO $\begin{array}{r} 15362 \\ +\ 23^{1}456 \\ \hline 38818 \end{array}$ **Column addition with decimals:** $\begin{array}{r} 56.3 \\ +\ \ 2.6 \\ \hline 58.9 \end{array}$	Pupils should be taught to: • Perform mental calculations, including with mixed operations and large numbers • Use their knowledge of the order of operations to carry out calculations involving the four operations • Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • Solve problems involving addition, subtraction, multiplication and division • Use estimation to check answer to calculations and determine, in the context of a problem, levels of accuracy. Notes and Guidance • Pupils should practise addition, subtraction, multiplication and division for larger numbers, using the efficient written methods of columnar addition and subtraction. • They should undertake mental calculations with increasingly large numbers and more complex calculations. • Pupils should round answers to a specified degree of accuracy. • Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.

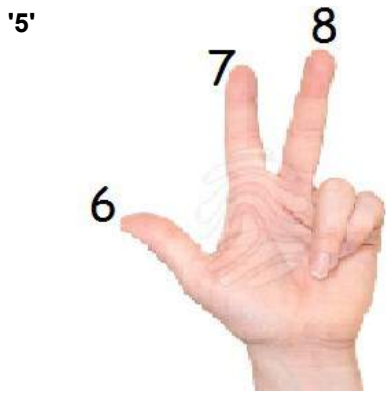
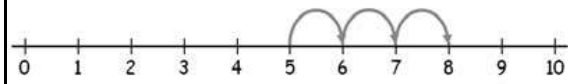
Subtraction

Subtraction Stage 1: Counting back (take away reduction)	Example of Written Method	Foundation Stage – Early Learning Goals
Mental method: Count how objects need to be 'taken away', physically moving them or crossing out pictures. Count how many are left. **Practise:** Use practical resources in playful and relevant context	 13-5 = 8  **10 – 4 = 6**	**Foundation Stage- Early Learning Goal** • Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. • Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. • They solve problems, including doubling, halving and sharing.

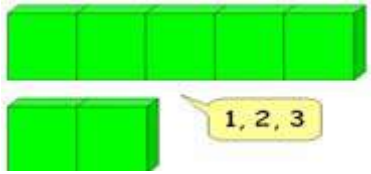
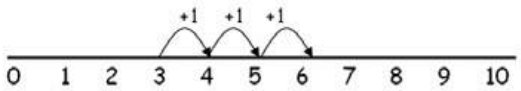
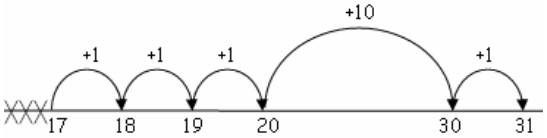
Subtraction

Stage 2: Counting back using Fingers	Example of Written Method	Foundation Stage – Early Learning Goals
Mental method: Verbally 'say' the largest number, and then use fingers to count back. Demonstrate on a number line. **Practise:** Practise subtraction strategy in playful situations and relevant contexts. Number bonds to 10 Doubles to 5 (double 1, 2, 3, 4, 5) Estimating the answer	**9-3=6** **10 – 4 = 6** 	**Foundation Stage Continued**

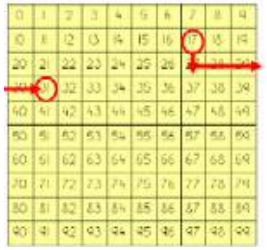
Subtraction

Stage 3: Count on from the smaller number	Example of written method	Year 1- Addition and Subtraction
Mental method: Children decide which number is the largest, verbally 'say' this number, and use fingers to count on. Verbally 'say' the largest number, and then use fingers to count back. Demonstrate on a number line. **Written method:** Write the number sentence. **Practise:** Use practical resources in playful and relevant context. Number bonds up to 20 Doubles up to 10 Estimating the answer Subtract one-digit and two digit numbers to 20 including zero.	**8-5= 3** **'5'**   **Include subtraction of 1 and 2 digit numbers to 20:** 18-9= 9	Pupils should be taught to: • read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately • add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero • represent and use number bonds and related subtraction facts within 20 • solve simple one-step word problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems. Notes and Guidance: • Pupils should memorise and reasons with number bonds to 10 and 20 in several forms (e.g. 9 + 7 = 16; 16-7 =9; 7 = 16-9). They should realise the effect of adding or subtracting zero. • Pupils should combine and increase numbers, counting forwards and backwards. • They should 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, more than and less than so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly. Range of vocabulary: Less than take away distance between

Subtraction

Stage 4: Counting on to find the difference	Example of written method	Year 1- Addition and Subtraction
Mental method: Step 1: Introduce using practical resources, verbally counting on 'How many more?' Step 2: Find the difference using a number line. Verbally say the smallest number and count on to the largest number. Step 3: Count up from the smallest number to the largest number. e.g. Start at 27 and count on to 31 **Written method:** Steps in subtraction can be recorded as 'jumps' on a number line. The steps often bridge through a multiple of 10. **Practise:** Use dienes apparatus Estimating the answer Number bonds and subtraction facts to 20 Partitioning two Relevant problem solving opportunities	**5-2= 3**  **6-3= 3**  **31-17= 14** 	Pupils should be taught to: • read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately • add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero • represent and use number bonds and related subtraction facts within 20 • solve simple word problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems. Notes and Guidance: • Pupils should memorise and reasons with number bonds to 10 and 20 in several forms (e.g. 9 + 7 = 16; 16-7 =9; 7 = 16-9). They should realise the effect of adding or subtracting zero. • Pupils should combine and increase numbers, counting forwards and backwards. • They should 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, more than and less than so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.

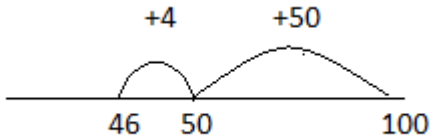
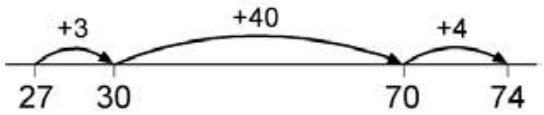
Subtraction

Stage 5: Introducing column subtraction	Example of written method	Year 2 - Addition and Subtraction
Mental method: Reinforce place value by partitioning 2 -digit numbers Subtraction on a hundred square, again reinforcing place value Introduce column subtraction, without borrowing. **Written method:** Record subtraction calculations initially in terms of partitioning, then introduce column subtraction. **Practise:** Use Dienes apparatus Estimating the answer Number bonds and subtraction facts to 20 Partitioning 2-digit numbers Relevant problem solving opportunities	**Partitioning a 2-digit number:** 10 + 5 =15 'One ten and five units make 15' **Subtraction on a hundred square:** 31 - 17= 14 4 units 'back' and one ten 'up' 4 + 10 = 14  **Column subtraction (without borrowing):** TO - O 1 8 - 6 1 2 TO - TO 1 8 - 1 2 6	Pupils should be taught to: • Solve simple one-step problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods • recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 • add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and units a two-digit number and tens two two-digit numbers • adding three one-digit numbers show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot • recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. Notes and Guidance: • Pupils should extend their understanding of the language of addition and subtraction to include sum and difference. • Pupils should practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using 3 + 7 = 10, 10 – 7 = 3 and 7 = 10 – 3 to calculate 30 + 70 = 100, 100 -70 = 30 and 70 = 100 – 30. They should check their calculations, including by adding to check subtraction and adding numbers in a different order to check addition (e.g. 5 + 2 + 1 = 1 + 5 + 2 + 1+ 2 + 5). • Recording addition and subtraction in columns supports place value and prepares for efficient written methods with larger numbers.

Subtraction

Stage 6: Recap partitioning and extend column subtraction	Example of written method	Year 3 - Addition and Subtraction
Mental method: Subtract the tens then the ones **Written method:** Record steps in subtraction using partitioning Move to column subtraction with up to 3 digits, including borrowing. **Practise:** Use Dienes apparatus Estimating the answer Number bonds and subtraction facts to 20 Partitioning 2 and 3-digit numbers Relevant problem solving opportunities	**Subtraction by partitioning to reinforce place value:** 58 – 23 = 146 – 27 = 58 – 20 146 - 20 38 – 3 126 - 7 35 119 **Introduce column subtraction with up to 3-digits. Include some borrowing:** TO - O 1 1 2 6 - 9 1 7 HTO – TO 3 1 1 4 6 - 3 7 1 0 9	Pupils should be taught to: • add and subtract numbers mentally, including: a three-digit number and ones a three-digit number and tens a three-digit number and hundreds • add and subtract numbers with up to three digits, using the efficient written methods of columnar addition and subtraction • estimate the answer to a calculation and use inverse operations to check answers • solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. Notes and Guidance: • Pupils should practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100. • Pupils should use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent.

Subtraction

Stage 7: Counting on find a missing number	Example of written method	Year 3 - Addition and Subtraction
Mental method: Count up from the smallest number to the largest number. Reduce the number of jumps by combining steps. **Written method:** Show jumps on an empty number line Write the number sentence **Practise:** Partitioning Addition and subtraction facts to 20 The counting- up method can be a useful alternative for children whose progress is slow, whose mental and written calculation skills are weak and whose projected attainment at the end of Key Stage 2 is towards the lower end of ARE	100-46= 54  74-27= 47  	Pupils should be taught to: • add and subtract numbers mentally, including: a three-digit number and ones a three-digit number and tens a three-digit number and hundreds • add and subtract numbers with up to three digits, using the efficient written methods of columnar addition and subtraction • estimate the answer to a calculation and use inverse operations to check answers • solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. Notes and Guidance: • Pupils should practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100. • Pupils should use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent.

Subtraction

Stage 8: Column subtraction	Example of written method	Year 4 - Addition and Subtraction
Mental method: Children place numbers in columns, drawing on their understanding of place value. **Written method:** Column subtraction with up to 4 digits, including borrowing. **Practise:** Use Dienes apparatus Estimating the answer Number bonds and subtraction facts to 20 Relevant problem solving opportunities	**Year 4 (Subtraction with up to 4-digits)** ThHTO - HTO 3 1 5 7 4 6 - 6 3 7 5 1 0 9	Pupils should be taught to: • add and subtract numbers with up to 4 digits using the efficient written methods of columnar addition and subtraction where appropriate • estimate and use inverse operations to check answers to a calculation • solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. Notes and Guidance: • Pupils should continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.

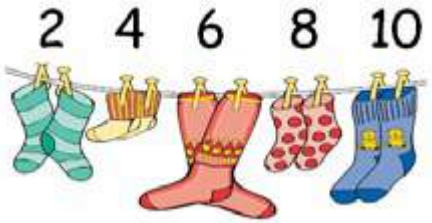
Subtraction

Stage 9: Extend column subtraction	Example of written method	Year 5 - Addition and Subtraction
Mental method: Children place numbers in columns, drawing on their understanding of place value. **Written method:** Compact subtraction remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable. **Practise:** Estimating the answer Relevant problem solving opportunities Partitioning two and three and 4-digit numbers	**Year 5 (Subtraction with up to 5 digits, including subtraction with decimals)** TThThHTO - ThHTO 6 1 4 1 7 2 6 5 4 - 5 6 2 7 6 7 0 2 7 **Column subtraction with decimals:** 5.3 - 2.2 3.2	Pupils should be taught to: • add and subtract whole numbers with more than 4 digits, including using efficient written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers • use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. Notes and Guidance: • Pupils should practise using the efficient written methods of columnar addition and subtraction with increasingly large numbers to aid fluency. • They should practise mental calculations with increasingly large numbers to aid fluency (e.g. 12 462 – 2 300 = 10 162).

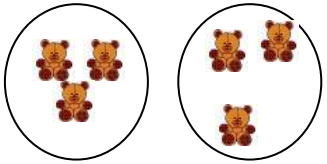
Subtraction

Stage 10: Continue to practise and apply skills.	Example of written method	Year 6 - Addition and Subtraction
Mental method: Children should be able to perform mental calculations, including with mixed operations and large numbers. **Written method:** Column subtraction involving larger numbers. **Practise:** Children should apply the formal written method to word and real-life problems.	**Use column subtraction in problem solving contexts.** **Continue to practise column subtraction and extend to large numbers when appropriate:** HThThHTO - ThHTO 6 1 4 1 ~~7~~ 2 6 ~~5~~ 4 - 5 6 2 7 6 7 0 2 7 Column subtraction with decimals: 5.3 - 2.2 3.2	Pupils should be taught to: • Perform mental calculations, including with mixed operations and large numbers • Use their knowledge of the order of operations to carry out calculations involving the four operations • Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • Solve problems involving addition, subtraction, multiplication and division • Use estimation to check answer to calculations and determine, in the context of a problem, levels of accuracy. Notes and Guidance • Pupils should practise addition, subtraction, multiplication and division for larger numbers, using the efficient written methods of columnar addition and subtraction. • They should undertake mental calculations with increasingly large numbers and more complex calculations. • Pupils should round answers to a specified degree of accuracy. • Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.

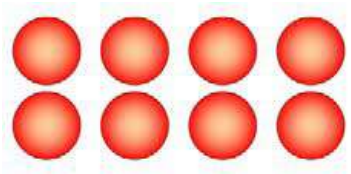
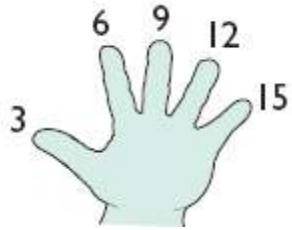
Multiplication

Multiplication Stage 1: Counting in equal steps of 2	Example of Written Method	Foundation Stage – Early Learning Goals
Mental method: Children will begin to count in steps of 10 More Able children counting in steps of 2. **Practise:** Use practical resources in playful and relevant context.		**Foundation Stage – Early Learning Goal** Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Multiplication

Multiplication Stage 2: Repeated addition	Example of Written Method	Year 1 – Multiplication and division
Mental Method: Children will experience equal groups of objects and will begin counting in 2s, 5s and 10s. **Written method:** Children write the groups of repeated addition, as shown in the diagram. **Recognise and write the 'x' sign in mathematical statements. Calculate the answer with the teacher using concrete objects.** **Practise:** Practise multiplication strategy in playful situations and relevant contexts.	 2 + 2 + 2 + 2 + 2 = 10 2 x 5 = 10 2 multiplied by 5 5 pairs  3 + 3 = 6 3 x 2 = 6 3 multiplied by 2 **Begin work on arrays**	Pupils should be taught to: • Solve simple one-step problems involving multiplication and division, calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Notes and guidance: • Through grouping and sharing small quantities, pupils should begin to understand multiplication and division; doubling numbers and quantities, and finding simple fractions of objects, numbers and quantities. • They should make connections between arrays, number patterns, and counting in twos, fives and tens.

Multiplication

Multiplication Stage 3: Arrays	Example of written method	Year 2 – Multiplication and division
Mental Method: Following on from repeated addition, children use multiplication strategy of arrays. Count in equal steps, then relate to multiplication fact. Children may also count equal steps using their fingers. **Written method:** Draw the array, then write multiplication sentence. **Use the X and = signs to write mathematical statements.** **Ensure pupils recognise that multiplication can be done in any order.** **Practise:** Estimating the answer **Times tables:** 2, 5 and 10 up to x 12. **Resources:** www.ictgames.com/arrayDisplay.html Primary National Strategy ITP – multi array Primary National Strategy Mathematics spreadsheets – Array creator	 4 x 2 = 8 2 x 4 = 8  	Pupils should be taught to: • Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs • Recognise and use the inverse relationship between multiplication and division in calculations • Show that multiplication of two numbers can be done in nay order (commutative) and division of one number by another cannot • Solve one-step problems involving multiplication and division, using materials, arrays, repeated addition, mental methods and multiplication and division facts, including problems in contexts. Notes and guidance: • Pupils should use a variety of language of describe multiplication and division. They are taught multiplication and division with larger numbers through equal grouping and sharing out quantities, relating multiplication tables to arrays and repeated addition and finding more complex fractions of objects, numbers and quantities. • Pupils should be introduced to the multiplications tables. They should practise to become fluent in the 2, 5 and 10 multiplications tables and connect them to each other. They connect the 10 multiplication tables to place value, and the 5 multiplication table to the divisions on the clock face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations. • Pupils should work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, relating these to fractions and measures (e.g. 40 ÷ 2 = 20, 20 is a half of 40). They use commutatively and inverse relations to develop multiplicative reasoning (e.g. 4 x 5 = 20 and 20 ÷ 5 = 4).

Multiplication

Stage 4: Partitioning Multiplication of TU x U Example of Written Method	Example of written method	Year 3 - Multiplication and division
Mental method: Step 1: TO number is partitioned and multiplied by the O Step 2: Totals are added together in column addition. **Written method:** Record steps in multiplication as shown in the diagram. **Practise:** Estimating the answer Relevant problem solving opportunities. Partitioning two and three-digit numbers **Times tables:** 2,3,4,5,8,10 up to x 12. Counting in 50s and 100s.	**37 x 4 =** **30 x 4 = 120** **7 x 4 = 28** **120 + 28 = 148**	Pupils should be taught to: • Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times on-digit numbers, using mental and progressing to efficient written methods • Solve problems, including missing number problems, involving multiplication and division including integer scaling problems and correspondence problems in which n objects are connected to m objects Notes and guidance: • Pupils should continue to practise their mental recall of multiplications 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 commutatively (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) and multiplication and division facts (e.g. using 3 x 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 x 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3). • Pupils should develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the efficient written methods of short multiplication and division. • Pupils should solve simple problems in contexts, deciding which of the four operations to use and why, including measuring and scaling contexts, and correspondence (e.g. 3 hats and 4 coats, how many different outfits; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

Multiplication

Stage 5: Short Multiplication	Example of written method	Year 4 – Multiplication and division
Mental method: Children place numbers in columns, drawing on their understanding of place value. **Written method:** Standard written method Multiplication of TO x O Extend to HTO x O **Practise:** Estimating the answer Relevant problem solving opportunities. **Times tables:** Derive and recall all multiplication facts up to 12 x12.	**38 x 7** 38 x 7 266 Extending to HTO x O	Pupils should be taught to: • Recall multiplication and division facts for multiplication tables up to 12 x 12 • Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers • Recognise and use factor pairs and commutatively in mental calculations • Multiply two-digit and three-digit numbers by a one-digit number using formal written layout • Solve problems involving multiplying and adding, including using the distributive law and harder multiplication problems such as which n objects are connected to m objects Notes and guidance: • Pupils should continue to practise recalling and using multiplication tables and related division facts to aid fluency. • Pupils should practise mental methods and extend this to three-digit numbers to derive facts, for example 200 x 3 = 600 into 600 ÷ 3 = 200, to become fluent. • Pupils should practise to become fluent in the efficient written method of short multiplication for multiplying using multi-digit numbers, and short division with exact answers when dividing by a one-digit number. • Pupils should write statements about the equality of expressions (e.g. use the distributive law 39 x 7 = 30 x 7 + 9 x 7 and associative law (2 x 3) x 4 = 2 x (3 x 4)). • Pupils should solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Multiplication

Stage 6: Long Multiplication	Example of written method	Year 5 – Multiplication and division
Mental method: Children place numbers in columns. Reinforce understanding of place value when multiplying by the ten. **Written method:** Record steps in multiplication as shown in the diagram. Multiplication of TO x TO Extend to HTO x TO **Practise:** Estimating the answer Relevant problem solving opportunities. **Times tables:** Derive and recall all multiplication facts up to 12 x 12.	**56 x 27** 56 × 27 is approximately 60 × 30 = 1800. $^{1}56$ x $2_{4}7$ 392 $11_{1}20$ 1512 **286 x 29** 286 × 29 is approximately 300 × 30 = 9000 $^{1}2_{1}86$ x $_{7}2_{5}9$ 2 574 $5_{1}720$ 8 294	Pupils should be taught to: • Identify multiples and factors, including finding all factor pairs • Solve problems involving multiplication and division where larger numbers are used by decomposing them into their factors • Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • Establish whether a number up to 100 is prime and recall prime numbers up to 19 • Multiply numbers up to 4 digits by a one- or two-digit number using an efficient written method, including long multiplication for two-digit numbers • Multiply and divide numbers mentally drawing upon known facts • Divide numbers up to 4 digits by a one-digit number using the efficient written method of short division and interpret remainders appropriately for the context • Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000. • Recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³) • Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates Notes and guidance: • Pupils should practise and extend their use of the efficient written methods of short multiplication and division. They apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations. • They should use and understand the terms factor, multiple and prime, square and cube numbers. • Pupils should 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 (e.g. 98 ÷ 4 = 24 r 2 = 24 ½ = 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.

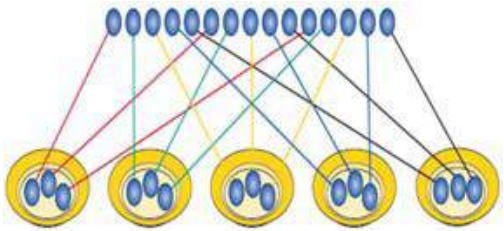
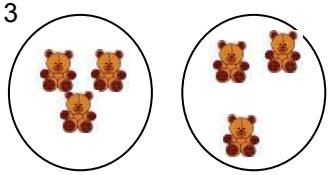
Multiplication

Stage 7: Extension and consolidation of long multiplication. Using and applying	Example of written method	Year 6 – Multiplication and division
Mental method: Children place numbers in columns. Reinforce understanding of place value when multiplying by the ten. **Written method:** Record steps in multiplication as shown in the diagram. Extend to ThHTO x TO **Practise:** Estimating the answer Relevant problem solving opportunities. **Times tables**: Derive and recall all multiplication facts up to 12 x 12.	**286 x 29** 286 × 29 is approximately 300 × 30 = 9000 $^{1}2^{1}86$ x $^{7}2^{5}9$ 2 574 $5^{1}720$ 8 294 **Extend to ThHTO**	Pupils should be taught to: • Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the efficient written method of long multiplication • Divide numbers up to 4 digits by a two-digit whole number using the efficient written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • Perform mental calculations, including with mixed operations and large numbers • Identify common factors, common multiples and prime numbers • Use their knowledge of the order of operations to carry out calculations involving the four operations • Solve problems involving addition, subtraction, multiplication and division • Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy Notes and guidance: • Pupils should practise addition, subtraction, multiplication and division for larger numbers, using efficient written methods of columnar addition and subtraction, short and long multiplication, and short and long division. • They should undertake mental calculations with increasingly large numbers and more complex calculations. • Pupils should continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency. • Pupils should round answers to a specified degree of accuracy. • Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.

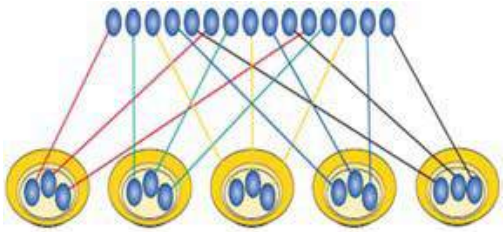
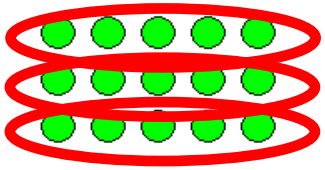
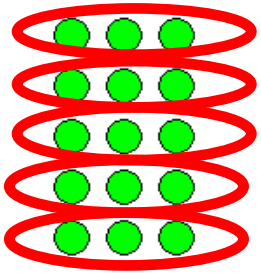
Division

Division Stage 1: Sharing practically	Example of Written Method	Foundation Stage – Early Learning Goals
Mental method: Children will begin to talk about sharing, using practical resources. **Practise:** Use practical resources in play-ful and relevant context.	Cut the pizza in half. How many pieces are there? 	**Foundation Stage – Early Learning Goal** Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

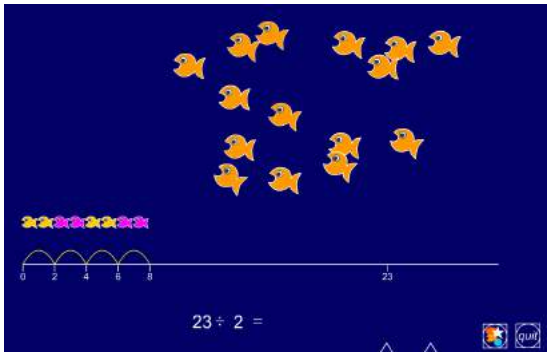
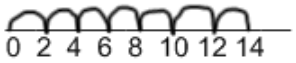
Division

Division Stage 2: Sharing into groups	Example of Written Method	Year 1 – Multiplication and division
Mental method: Children will begin to practically share objects into groups. Use words: '5 groups of 3' or '2 groups of 3' etc. Children will begin to recognise and write the ¸ symbol in mathematical statements, calculating the answer to word problems using practical objects and recording number sentence (with teacher support). **Practise:** Use practical resources in playful and relevant context.	 15 marbles are shared out equally among 5 children. 15 ÷ 5 = 3 6 teddies shared into 2 hoops. 6 ÷ 2 = 3 	Pupils should be taught to: • Solve simple one-step problems involving multiplication and division, calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Notes and guidance: • Through grouping and sharing small quantities, pupils should begin to understand multiplication and division; doubling numbers and quantities, and finding simple fractions of objects, numbers and quantities. • They should make connections between arrays, number patterns, and counting in twos, fives and tens.

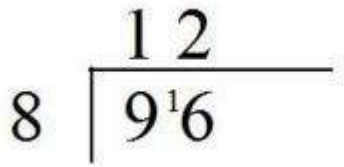
Division

Division Stage 3: Using arrays	Example of Written Method	Year 2 – Multiplication and division
Mental method: Following on from practical sharing, children should now be familiar with the ÷ sign and will write mathematical statements, calculating the answer to word problems using practical objects and recording number sentences. Again use words: '5 groups of 3' or '2 groups of 3' etc. **Written method:** Draw the array, then write division sentence. Use the ÷ and = signs to write mathematical statements. Ensure pupils use inverse relations (e.g. 4 x 5 = 20 and 20 ÷ 5 = 4). **Practise:** Estimating the answer. Relevant problem solving opportunities. **Times Tables:** Recall of division facts for 2, 5 and 10 times tables	15 marbles are shared out equally among 5 children. 15 ÷ 5 = 3  **Use of arrays: Sharing** The gardener planted 15 seeds in 3 equal rows. ***How many seeds in each row?*** 15 ÷ 3 = 5  **Grouping** The gardener planted 15 seeds with 3 seeds in each row. ***How many rows of seeds are there?*** 15 ÷ 3 = 5 	Pupils should be taught to: • Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs • Recognise and use the inverse relationship between multiplication and division in calculations • Show that multiplication of two numbers can be done in nay order (commutative) and division of one number by another cannot • Solve one-step problems involving multiplication and division, using materials, arrays, repeated addition, mental methods and multiplication and division facts, including problems in contexts. Notes and guidance: • Pupils should use a variety of language of describe multiplication and division. They are taught multiplication and division with larger numbers through equal grouping and sharing out quantities, relating multiplication tables to arrays and repeated addition and finding more complex fractions of objects, numbers and quantities. • Pupils should be introduced to the multiplications tables. They should practise to become fluent in the 2, 5 and 10 multiplications tables and connect them to each other. They connect the 10 multiplication tables to place value, and the 5 multiplication table to the divisions on the clock face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations. • Pupils should work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, relating these to fractions and measures (e.g. 40 ÷ 2 = 20, 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (e.g. 4 x 5 = 20 and 20 ÷ 5 = 4).

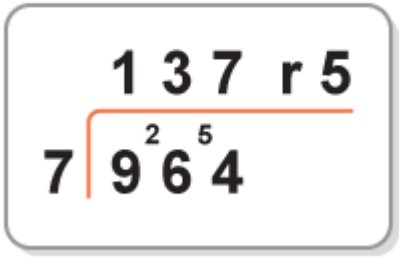
Division

Division Stage 4: Grouping on a number line	Example of Written Method	Year 3 - Multiplication and division
Mental Method: Recall multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables. **Written method:** Develop reliable written methods for division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the efficient written method of short division. **Practise:** Relevant problem solving opportunities. **Times Tables:** Recall of division facts for 2, 3, 4, 5, 8 and 10 times tables. **Resources:** Primary National Strategy Mathematics ITPs – Grouping	 **14 ÷ 2 = 7**  	Pupils should be taught to: • Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, Including for two-digit numbers times on-digit numbers, using mental and progressing to efficient written methods • Solve problems, including missing number problems, involving multiplication and division including integer scaling problems and correspondence problems in which n objects are connected to m objects Notes and guidance: • Pupils should continue to practise their mental recall of multiplications 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 (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) and multiplication and division facts (e.g. using 3 x 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 x 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3). • Pupils should develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by on -digit numbers and progressing to the efficient written methods of short multiplication and division. • Pupils should solve simple problems in contexts, deciding which of the four operations to use and why, including measuring and scaling contexts, and correspondence (e.g. 3 hats and 4 coats, how many different outfits; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

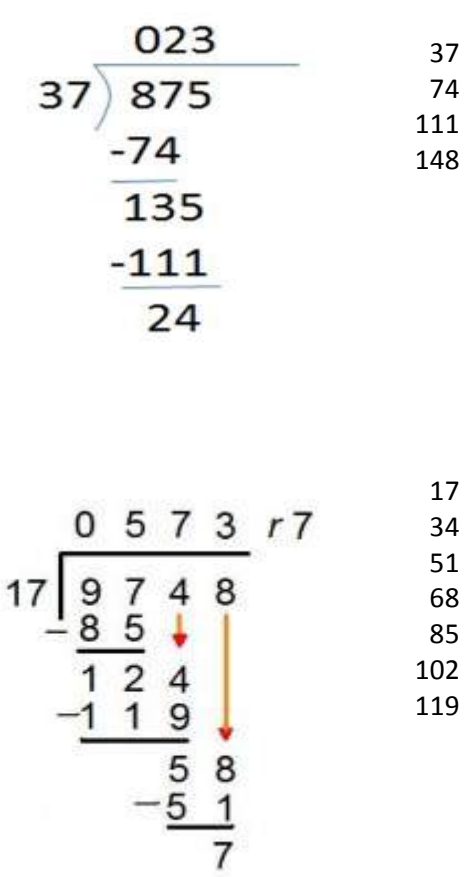
Division

Division Stage 5: Short division	Example of Written Method	Year 4 – Multiplication and division
Mental Method: Continue to practise recalling multiplication facts and related division facts to aid fluency. **Written method:** Short division TO ÷ O as shown in the example. Extend to HTO ÷ O **Practise:** Estimating the answer Relevant problem solving opportunities. **Times Tables:** Recall of division facts all tables up to 12 x 12.	 **Extend to HTO ÷ O**	Pupils should be taught to: • Recall multiplication and division facts for multiplication tables up to 12 x 12 • Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers • Recognise and use factor pairs and commutativity in mental calculations • Multiply two-digit and three-digit numbers by a one-digit number using formal written layout • Solve problems involving multiplying and adding, including using the distributive law and harder multiplication problems such as which n objects are connected to m objects Notes and guidance: • Pupils should continue to practise recalling and using multiplication tables and related division facts to aid fluency. • Pupils should practise mental methods and extend this to three-digit numbers to derive facts, for example 200 x 3 = 600 into 600 ÷ 3 = 200, to become fluent. • Pupils should practise to become fluent in the efficient written method of short multiplication for multiplying using multi-digit numbers, and short division with exact answers when dividing by a one-digit number. • Pupils should write statements about the equality of expressions (e.g. use the distributive law 39 x 7 = 30 x 7 + 9 x 7 and associative law (2 x 3) x 4 = 2 x (3 x 4)). • Pupils should solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Division

Division Stage 6: Long division	Example of Written Method	Year 5 – Multiplication and division
Mental Method: Continue to practise recalling multiplication facts and related division facts to aid fluency. **Written method:** Continue to practise short division as shown in example. TO ÷ O, HTO ÷ O, ThHTO ÷ O. **Practise:** Estimating the answer Interpreting remainders appropriately. Relevant problem solving opportunities. **Times Tables:** Recall of division facts all tables up to 12 x 12.	 1 3 7 r 5 7 | 9 2 6 5 4 Extend to ThHTO ÷ O. Interpret remainders appropriately for the context.	Pupils should be taught to: • Identify multiples and factors, including finding all factor pairs • Solve problems involving multiplication and division where larger numbers are used by decomposing them into their factors • Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • Establish whether a number up to 100 is prime and recall prime numbers up to 19 • Multiply numbers up to 4 digits by a one- or two-digit number using an efficient written method, including long multiplication for two-digit numbers • Multiply and divide numbers mentally drawing upon known facts • Divide numbers up to 4 digits by a one-digit number using the efficient written method of short division and interpret remainders appropriately for the context • Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000. • Recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³) • Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates Notes and guidance: • Pupils should practise and extend their use of the efficient written methods of short multiplication and division. They apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations. • They should use and understand the terms factor, multiple and prime, square and cube numbers. • Pupils should 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 (e.g. 98 ÷ 4 = 24 r 2 = 24 ½ = 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.

Division

Division Stage 7: Long division Using and applying	Example of Written Method	1. Year 6 – Multiplication and division
Mental Method: Continue to practise recalling multiplication facts and related division facts to aid fluency. **Written method:** Long division HTU ÷ TU. Extend to ThHTU ÷ TU as shown in the example. **Practise:** Estimating the answer Relevant problem solving opportunities. **Times Tables:** Recall of division facts all tables up to 12 x 12.	 Interpret remainders appropriately for the context.	Pupils should be taught to: • Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the efficient written method of long multiplication • Divide numbers up to 4 digits by a two-digit whole number using the efficient written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • Perform mental calculations, including with mixed operations and large numbers • Identify common factors, common multiples and prime numbers • Use their knowledge of the order of operations to carry out calculations involving the four operations • Solve problems involving addition, subtraction, multiplication and division • Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy Notes and guidance: • Pupils should practise addition, subtraction, multiplication and division for larger numbers, using efficient written methods of columnar addition and subtraction, short and long multiplication, and short and long division. • They should undertake mental calculations with increasingly large numbers and more complex calculations. • Pupils should continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency. • Pupils should round answers to a specified degree of accuracy. • Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.