MATHEMATICS CALCULATION POLICY 2022 – 2025

Approved by	
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Position:	Headteacher
Signed:	
Date:	30th August 2022
Review date:	Autumn 2025

REVIEW SHEET

The information in the table below details earlier versions of this document with a brief description of each review and how to distinguish amendments made since the previous version date (if any).

Version Number	Version Description	Date of Revision
1	Original	2019
2	Review – update EYFS ELG	August 2022

Progression towards a standard written method of calculation

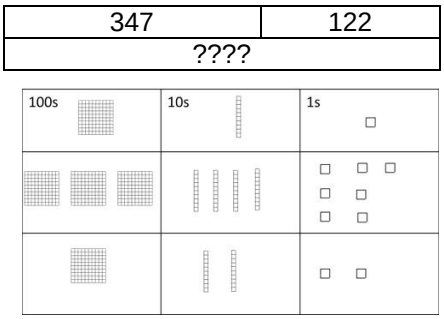
Introduction

This calculation policy has been written in line with the programmes of study taken from the revised National Curriculum for Mathematics (2014). It provides guidance on appropriate calculation methods and progression.

Children will always be encouraged to look at a calculation/problem and then decide which is the best method to choose. Our aim is for children to be able to select an efficient method of their choice (whether this be mental, jottings or formal written methods) that is appropriate for a given task. They will do this by always asking themselves:

- 'Can I do this in my head?'
- 'Can I do this in my head using drawings or jottings?'
- 'Do I need to use a pencil and paper procedure?'
- 'Do I need a calculator?'

Key to the successful implementation of this policy is the consistent use of representations (model and images that support conceptual understanding of the mathematics). This policy promotes a range of relevant representations, across the primary years. Mathematical understanding is developed through the use of representations that are first of all **concrete** (e.g.: real life objects, Numicom, Base-10 Apparatus), and then **pictorial** (e.g.: arrays, place value counters, bar models, calculation mats) to then facilitate **abstract** working (columnar addition, long multiplication etc.).

Concrete → *Pupils manipulate hand-on, concrete materials*	**Pictorial** → *Pupils draw and observe diagrams, or watch the teacher touching and moving hand-on materials*	**Abstract** *Numbers and mathematical symbols*
 'You have five apples and I have three apples. How many apples altogether?'		657 + 435 = ? 657 + 435 1092 1

Aims of the policy

- To ensure consistency and progression in our approach to calculation throughout the school following The Big Maths progress drives.
- To ensure children have a secure knowledge of number facts and a good understanding of the four operations.
- To ensure that children develop an efficient, reliable, formal written method of calculation for all operations that they can apply with confidence when undertaking calculations that they cannot carry out mentally.

How the policy is used

- The basis of teacher planning, ensuring the use of previous or following years' guidance to allow for personalised learning.
- Always used in conjunction with assessment to identify suitable next steps in calculation for groups of children.
- If, at any time, children are making significant errors, then the previous stage in calculation is returned to.
- Cross-referenced with the progression in calculation document and progression in mental calculations for guidance on key facts, key vocabulary and mental methods.
- Always used with suitable resources, models and images to support children's understanding of calculation and place value, as appropriate.
- Encourage children to make sensible choices about the methods they use when solving problems.

Mental Calculations

Mental methods will be established. These will be based on a solid understanding of place value in number and will include the following:

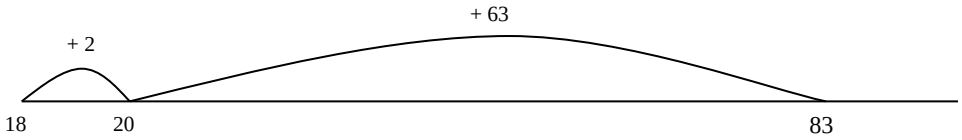
- Remembering number facts and recalling them without hesitation *e.g. Big Maths Learn Its such as pairs of numbers which make 10, doubles & halves to 20.*

- Using known facts to calculate unknown facts *e.g. 6 + 6 = 12 therefore 6 + 7 = 13 24 + 10 = 34 therefore 24 + 9 = 33.*

- Understanding and using relationships between addition & subtraction to find answers and check results *e.g. 14 + 6 = 20 therefore 20 –6 = 14.*

- Having a repertoire of mental strategies to solve calculations *e.g. doubles / near doubles*, *bridging 10 / bridging 20*, *adding 9 by +10 & -1.*

- Making use of informal jottings such as blank number lines to assist in calculations with larger numbers *e.g.83 – 18 = 65 (with two jumps only).*



- Solving one-step word problems (either mentally or with jottings) by identifying which operation to use, drawing upon their knowledge of number bonds and explaining their reasoning.

- Beginning to present calculations in a horizontal format and explain mental steps using numbers, symbols or words.

- Learn to estimate/approximate first e.g. 29 + 30 (round up to nearest 10, the answer will be near to 60).

- Place value will be taught mentally first from Reception class where number tracks are used, progressing to number lines (to 10 or 20 as appropriate) in Years 1 and 2. The empty number line will then be introduced to aid calculations.

- Subtraction will be taught by counting on and counting back depending on the numbers.

- Numbers such as 10, 100, 1000 will be called Landmark Numbers.

When are the children ready for written calculations?

The children work through a detailed sequence of progression: 'progress drives' in the calculation part of the CLIC Big Maths session. Children master many high-understanding steps before they start to learn efficient column methods. The children experience teaching and learning in both mental and written calculations and they complement one another. It is expected that if a child is on track that they will be first introduced to column methods in addition and subtraction in Y2 term 3 and in multiplication and division in Y3 term 3.

In Big Maths children are encouraged to solve questions 'brain only.' This development happens through a three-part process called the **FAB** continuum: **F** – for full. We start off with a full written method that is high on understanding. **A** is for abridged. The writing is taken away gradually, training the brain to hold numbers in the head. **B** is for Brain: Finally the child is left with the ability to solve the question in their head.

Key Milestones – Mathematics National Curriculum

Maths requires skills and knowledge to be firmly in place before the next steps can be taken. For some children this will take longer than others. Listed below are some of the key milestones which children will need to master before moving onto the next stage.

EARLY YEARS FOUNDATION STAGE

Reception

- Have a deep understanding of number to 10, including the composition of each number.
- Subitise (recognise quantities without counting) up to 5.
- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.
- Verbally count beyond 20, recognising the pattern of the counting system.
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity.
- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

KEY STAGE 1

Year 1

- Count to and across 100, forwards & backwards from any number.
- Read and write numbers to 20 in numerals & words.
- Read and write numbers to 100 in numerals.
- Say 1 more/1 less to 100.
- Count in multiples of 2, 5 & 10.
- Use bonds and subtraction facts to 20.
- Add & subtract 1 digit and 2 digit numbers to 20, including zero.
- Solve one-step multiplication and division using objects, pictorial representation and arrays.
- Recognise half and quarter of object, shape or quantity.
- Sequence events in chronological order.
- Use language of day, week, month and year.
- Tell time to hour & half past.

Year 2

- Compare and order numbers up to 100 and use < > =.
- Read and write all numbers to 100 in digits & words.
- Say 10 more/less than any number to 100.
- Count in steps of 2, 3 & 5 from zero and in 10s from any number (forwards and backwards).
- Recall and use multiplication & division facts for 2, 5 & 10 tables.
- Recall and use +/- facts to 20.
- Derive and use related facts to 100.
- Recognise place value of any 2-digit number.
- Add and subtract:
- 2-digit numbers & ones.
- 2-digit numbers & tens.
- Two 2-digit numbers.
- Three 1-digit numbers.
- Recognise and use inverse (+/-).
- Calculate and write multiplication & division calculations using multiplication tables.

- Recognise, find, name and write 1/3; 1/4; 2/4; 3/4.
- Write and recognise equivalence of simple fractions.
- Tell time to five minutes, including quarter past/to.

LOWER KEY STAGE 2

Year 3

- Compare & order numbers up to 1000.
- Read & write all numbers to 1000 in digits and words.
- Find 10 or 100 more/less than a given number.
- Count from 0 in multiples of 4, 8, 50 and 100.
- Recall and use multiplication and division facts for 3, 4, 8 tables.
- Recognise place value of any 3-digit number.
- Add and subtract:
- 3-digit numbers and ones.
- 3-digit numbers and tens.
- 3-digit numbers and hundreds.
- Add and subtract:
- Numbers with up to 3-digits using written columnar method.
- Estimate and use inverse to check.
- Multiply a 2-digit number by 1-digit number.
- Count up/down in tenths.
- Compare and order fractions with same denominator.
- Add and subtract fractions with same denominator with whole.
- Tell time using 12 and 24 hour clocks; and using Roman numerals.
- Tell time to nearest minute.
- Know number of days in each month and number of seconds in a minute.

Year 4

- Count backwards through zero to include negative numbers.
- Compare and order numbers beyond 1,000.
- Compare and order numbers with up to 2 decimal places.
- Read Roman numerals to 100.
- Find 1,000 more/less than a given number.
- Count in multiples of 6, 7, 9, 25 and 1000.
- Recall and use multiplication and division facts all tables to 12x12.
- Recognise place value of any 4-digit number.
- Round any number to the nearest 10, 100 or 1,000.
- Round decimals with 1dp to nearest whole number.
- Add and subtract numbers with up to 4-digits using written columnar method.
- Multiply:
- 2-digit number by 1-digit number.
- 3-digit number by 1-digit number.
- Count up/down in hundredths.
- Recognise and write equivalent fractions
- Add and subtract fractions with same denominator.
- Read, write and convert time between analogue and digital 12 and 24 hour clocks.

UPPER KEY STAGE 2

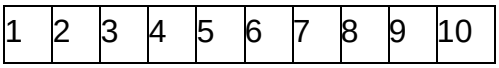
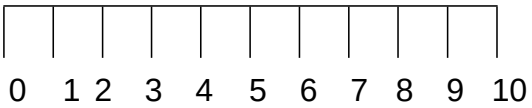
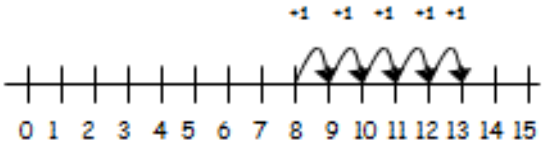
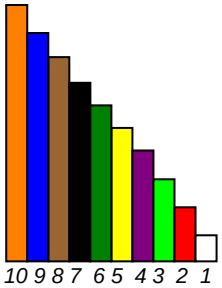
Year 5

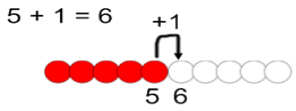
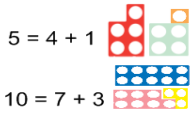
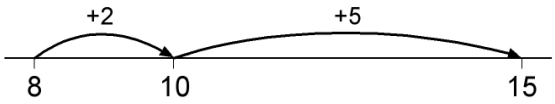
- Count forwards and backward with positive and negative numbers through zero.
- Count forwards/backwards in steps of powers of 10 for any given number up to 1,000,000.
- Compare and order numbers up to 1,000,000.
- Compare and order numbers with 3 decimal places.
- Read Roman numerals to 1,000.
- Identify all multiples and factors, including finding all factor pairs.
- Use known tables to derive other number facts.
- Recall prime numbers up to 19.
- Recognise and use square numbers and cube numbers.
- Recognise place value of any number up to 1,000,000.
- Round any number up to 1,000,000 to the nearest 10, 100, 1000, 10,000 or 100,000.
- Round decimals with 2 decimal places to nearest whole number and 1 decimal place.
- Add and subtract numbers with more than 4-digits using formal written method.
- Use rounding to check answers.
- Multiply 4-digit numbers by 1-digit/ 2-digit numbers.
- Divide up to 4-digit numbers by 1-digit number.
- Multiply and divide whole numbers and decimals by 10, 100 and 1,000.
- Recognise and use thousandths.
- Recognise mixed numbers and improper fractions and convert from one to another.
- Multiply proper fractions and mixed numbers by whole numbers.
- Identify and write equivalent fractions.
- Solve time problems using timetables and converting between different units of time.

Year 6

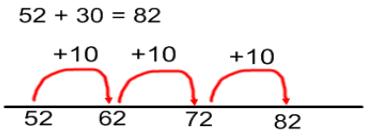
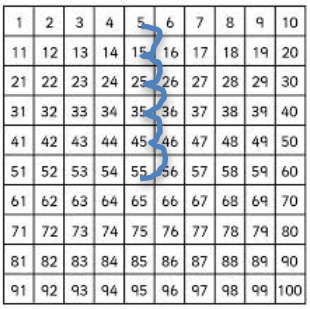
- Use negative numbers in context and calculate intervals across zero.
- Compare and order numbers up to 10,000,000.
- Identify common factors, common multiples and prime numbers.
- Round any whole number to a required degree of accuracy.
- Identify the value of each digit to 3 decimal places.
- Use knowledge of order of operations to carry out calculations involving four operations.
- Multiply 4-digit numbers by 2-digit numbers.
- Divide 4-digit numbers by 2-digit numbers.
- Add and subtract fractions with different denominators and mixed numbers.
- Multiply simple pairs of proper fractions, writing the answer in the simplest form.
- Divide proper fractions by whole numbers.
- Calculate percentage of whole number.

+ Addition +

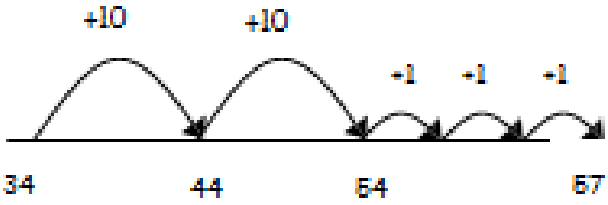
STEP	Concept & images	Comments
End of Year Age Related Expectation: Reception		
1 Early addition.	Children will engage in a wide variety of songs and rhymes, games and activities. They will begin to relate addition to combining two groups of objects, first by counting all and then by counting on from the largest number. Combining groups of objects to find the total using concrete objects. 	Put all objects together and count… Find total of 2 groups using objects in hoops… Then total of 2 groups using objects and numerals in hoops… Then… total of 2 groups using objects and hoops and recording as a number sentence… Then without hoops, with objects and record as a number sentence
End of Year Age Related Expectation: Year 1		
2 Relating groups of objects to number line and number rods.	'Informal number line' / number sentences  As above, alongside a calculation  Children should experience a range of representations of number lines, such as the progression listed below. *Number track*  *Number line, all numbers labelled*  • Number line, 5s and 10s labelled • Number line, 10s labelled • Number lines, marked but unlabelled 8 + 5 = 13  *Bar Model using Number rods* *8+ 5 = 13* 	Look at number sentences. Use objects on sheets to find answer. Then… Look at number sentences – use objects provided to find the answer. Look at number sentences: what do we have to do? Use objects to find an answer. *The number rods are a concrete representation of the number sentence. Each rod is individual, and each colour represents a different amount, allowing the pupil to move them around in any order to obtain the total amount.* 

Locating numbers on a number line & adding one more.	Add one onto a number Add one onto a number 	Find 5 on number track, and then add one. Encourage children to locate the first number and count on from there, rather than starting at zero. Find 5 on the number line then add one more.
Number bonds **up to** 20.	How many ways of splitting up a number? 10 = ? + ? 9 = ? + ? 8 = ? + ? etc *Numicom*  *Bar Models using number rods* *7 + 3 = 10* 	In order to calculate effectively children must know all the bonds for numbers up to ten. This will enable them to **jump** on the number line rather than *count*. Using a bead bar is also an effective way to showing how to split smaller numbers up KS1 children to also model this using jumps on a number line in order to lead to step 5.
Using number bonds to add on the number line.	Bridge 10 (e.g. 8 + 7 =15) 8 + 7 = 15 Seven is partitioned into 2 and 5; 2 creating a number bond to 10 with the 8 and then the 5 is added to the 10.  Recognise that number sentences can be represented in several forms: 9 + 7 = 16 7 + 9 = 16 16 – 7 = 9 16 – 9 = 7 Solve missing number problems:	Emphasise JUMP on number line, NOT counting! Use number bonds to jump to the next ten on the number line. Then add what is left in one jump.

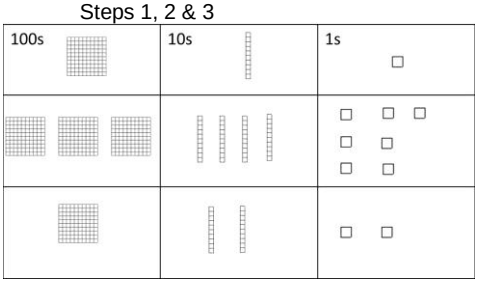
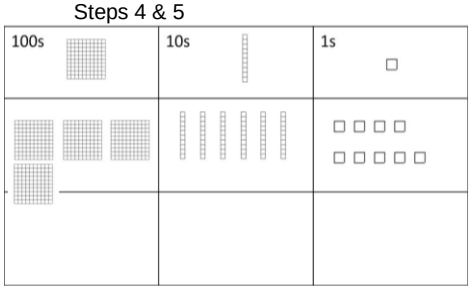
	8 + ? = 15 ? + 7 = 15	

Using number line or hundred square to jump in tens from any 2-digit number.	Adding multiples of 10  Jumping forwards in tens using a hundred square. 	Starting from any 2-digit number children must be able to jump in steps of ten. *Focus on what happens to the tens and units as you count.* *Focus on tricky parts: counting over 100, counting back past 20 in the teen numbers*.

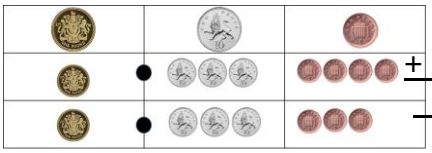
End of Year Age Related Expectation: Year 2

Adding on the number line or hundred square.	TU + TU 34 + 23 = 57  Alongside the number line/hundred square, pupils are asked to think of a number story or situation to help them add the numbers together *i.e.: I went to the shop and bought 34 chocolate bars and 23 bags of crisps. How many items did I buy altogether?*	This puts together the two previous ways of adding on a number line. THE NUMBER LINE REPRESENTS THE JUMPS IN YOUR HEAD! *If adding near multiples of ten, more confident pupils can do adding a ten and adjusting:* *43 + 19, = 43 + 20 = 63 -1 = 62*

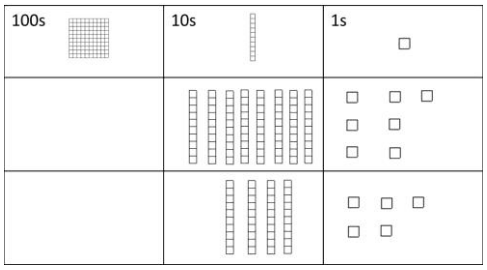
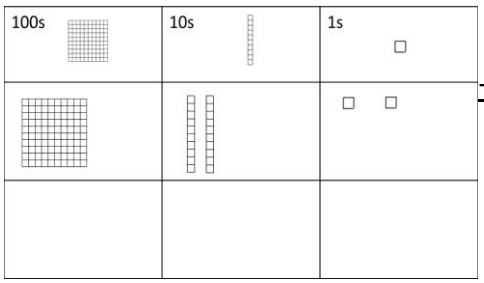
*End of Year Age Related Expectation: KS2**

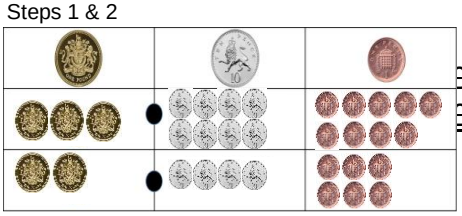
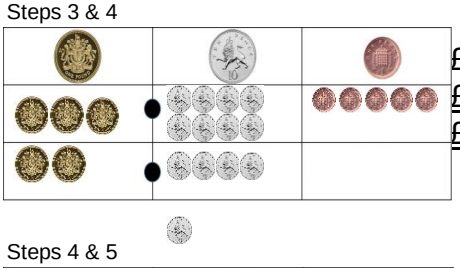
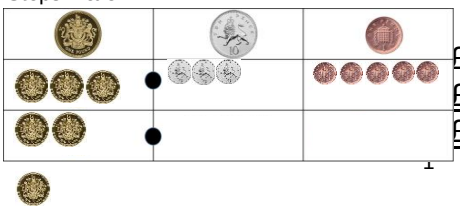
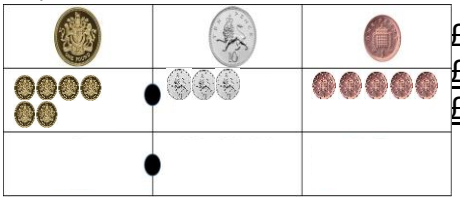
Column addition for adding pairs numbers not involving regrouping. ** 3 digits – Year 3* ** 4 digits – Year 4* ** more than 4 digits – Year 5 +*	*HTU + HTU using partitioning:* 347 + 122 = 300 + 40 + 7 +100 + 20 + 2 400 + 60 + 9 = 469 This will be introduced pictorially using bar models and practical equipment first. *Bar Model* The bar model is used as a pictorial representation of the calculation, along with a number story *ie: At the weekend I went swimming. On Saturday I swam 347 metres and on Sunday I swam 122 metres. How far did I swim altogether?* 347 | 122 ???? *Base-10 apparatus and calculation mat*  Calculation mat with written calculation alongside. 347 + 122 = ? Steps 1, 2 & 3  347 + 122 Steps 4 & 5  347 + 122 469	Children work through 11 steps in the column addition progress drive. It is expected that they will begin column methods after step 24 in the CLIC. They will continue to work on mental methods and on the FAB continuum. Start by partitioning the numbers so the children understand what each column represents. Children should only use this when adding together 3-digit numbers and preferably when the units add to more than ten (although to introduce concept using simpler numbers is a good idea). *Using the calculation mat:* 1. The number sentence is written as a column addition. 2. 347 is represented on the top row of the calculation mat in its partitioned form (7 ones, 4 tens and 3 hundreds). 3. 122 is represented in the second row of the calculation mat in its partitioned form. 4. Working from the right hand column, the 2 ones are combined with 7 ones into top ones box. 5. Repeated with tens and hundred column. Written calculations are completed alongside the equipment, with each step completed on the mat is then completed as a written method.

End of Year Age Related Expectation: Year 3

Column addition in the context of money not involving regrouping.	This will be introduced using bar models and number stories (as above) and practical equipment first. Calculation mat (money) with written calculation alongside.  £1.34 + £1.33 £2.67	Start by representing the numbers on the calculation mat so children understand the place value of money. The same method is used for calculating the answers as when using the Base-10 apparatus calculation mat (as detailed above). Written calculations are completed alongside the equipment, with each step completed on the mat is then completed as a written method.

*End of Year Age Related Expectation: KS2**

Column addition for adding pairs numbers involving regrouping. ** 3 digits – Year 3* ** 4 digits – Year 4* ** more than 4 digits – Year 5 +*	This will be introduced using bar models and number stories (as above) and practical equipment first. Calculation mat with written calculation alongside.  87 + 45 2 5 ones + 7 ones equal to 12 ones, so we regroup 10 of the ones into 1 ten and show this regrouping by placing another ten in the tens column. 8 tens + 4 tens + 1 ten (from regrouping of 7 + 5) equals 12 tens, so we regroup 10 of the tens into 1 hundred and show this regrouping by placing the hundred in the hundreds column.  87 + 45 132 1	Start by representing the numbers on the calculation mat so children understand the place value. The use of the calculation mat is the same details above. Written calculations are completed alongside the equipment, with each step completed on the mat then completed as a written method. Regrouping emphasise that the value of the number has not changed, eg: when a pupil regroups 12 ones into 1 ten and 2 ones the value of the number has not changes; the number has just be grouped in a different way.

Column addition in the context of money involving regrouping.	This will be introduced using bar models and number stories (as above) and practical equipment first. Calculation mat (money) with written calculation alongside. Steps 1 & 2  £3.89 £2.46 Steps 3 & 4  £3.89 £2.46 £ . 5 1 Steps 4 & 5  £3.89 £2.46 £ .35 1 1 Step 5  £3.89 £2.46 £6.35 1 1	Start by representing the numbers on the calculation mat so children understand the place value. The use of the calculation mat is the same details above. Written calculations are completed alongside the equipment, with each step completed on the mat then completed as a written method. Regrouping emphasis that the value of the number has not changed, eg: when a pupil regroups 12 ones into 1 ten and 2 ones the value of the number has not changes; the number has just be grouped in a different way.

Compact Column addition. ** 3 digits – Year 3* ** 4 digits – Year 4* ** more than 4 digits – Year 5 +*	This will be introduced using bar models and number stories (as above). 347 + 122 = ? 347 + 122 469 Then, with regrouping: 359 + 258 = ? 359 + 258 617 1 1	As the children become more confident in column addition they can gradually start to use the compact method for speed. It is vital that they still understand that the small '1' represents tens or hundreds.

End of Year Age Related Expectation: Year 5 +

Compact Column addition with decimals.	This will be introduced using bar models and number stories (as above). Same number of decimal places: 78.5km + 54.6km = ?km 78.5 km + 54.6 km 133.1 km 1 1 Then, numbers with different number of digits and decimal places: 124.9 + 7.25 = ? 124.9 + 7.25 132.15 1 1	As with the compact column addition strategy it is vital that children understand what each column represents in terms of value.

Problem Solving

Throughout the progression of addition, once the children have mastered their age appropriate strategy, deepening their understanding of addition will be taught in context of real life situations through word problems.

Word problems, whether one step, two-step or multi-step, will be taught using the following acronym:

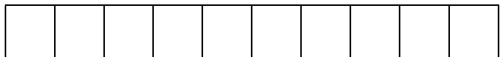
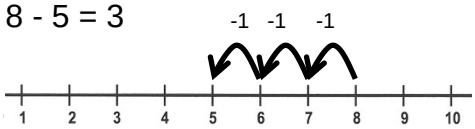
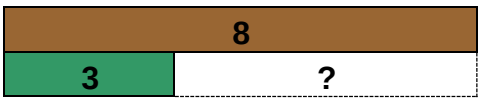
R **Read** the question.
I **Imagine** how you would solve the problem.
T **Talk** to your partner about how you would solve the problem.
A **Action** the problem through using maths equipment (i.e. real life objects, number rods, Base-10 apparatus).

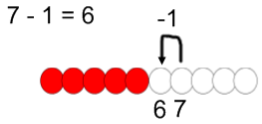
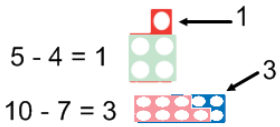
D **Draw** a diagram (i.e. a bar model).

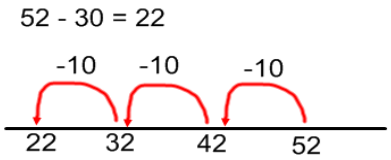
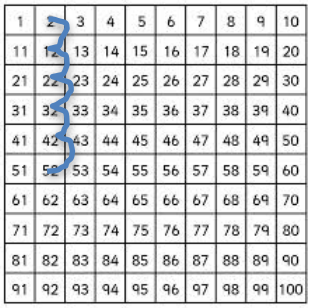
or

R **Read** the question
U **Understand** the problem
C **Choose** the number operation to use to solve the problem
S **Solve** the problem
A **Answer**
C **Check** the answer.

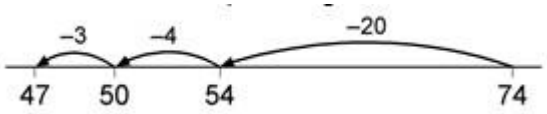
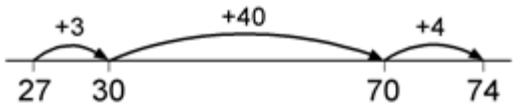
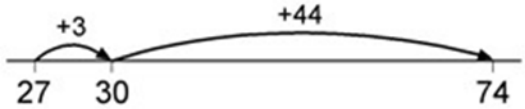
– Subtraction –

STEP	Concept & images	Comments
End of Year Age Related Expectation: Reception		
Early subtraction	Children will engage in a wide variety of songs and rhymes, games and activities. Take away a number of objects from the group, count what's left 	Then… start with group of objects and record the numeral. Take some away, record and count what's left (record) '6 take away 3 is 3 OR 3 less than 6 is 3'.
End of Year Age Related Expectation: Year 1		
Relating groups of objects to number lines	Introduce – and = symbols Include vocabulary: 'difference' Relate to number line  Children should experience a range of representations of number lines, such as the progression listed below. Number track 1 2 3 4 5 6 7 8 9 10 Number line, all numbers labelled  0 1 2 3 4 5 6 7 8 9 10 • Number line, 5s and 10s labelled • Number line, 10s labelled • Number lines, marked but unlabelled 8 - 5 = 3  *Bar Models using number rods* *8 – 3 = 5* 	Emphasise JUMPING on number line, not counting. Then… look at a number line: what do we need to do?

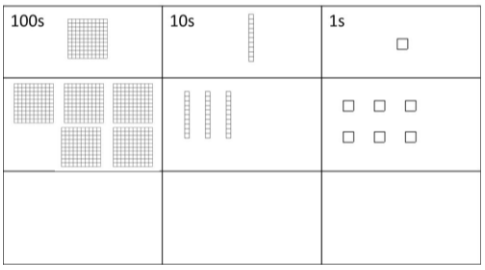
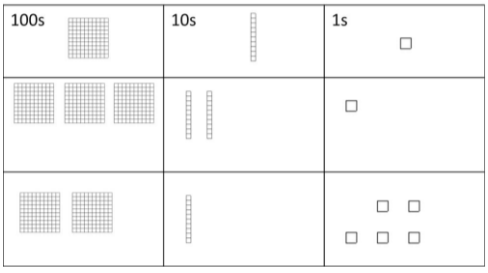
Locating numbers on a number line and finding one less.	Take away one from a number 	Find 7 on number track, then SUBTRACT one. Encourage children to locate the first number and count back from there, rather than starting at zero.
Number bonds **up to** 20.	Inverse use of number bonds (the opposite of step 4 for addition)  *Bar Models using number rods* *10 – 6 = ?* 	Model with Numicon and/or number rods. In order to calculate effectively children must know all the bonds for numbers up to ten. This will enable them to **jump** back on the number line rather than *count*. KS1 children to also model this using jumps on a number line in order to lead to jumping back bridging 10..
Using number bonds to jump back on a number line.	Jumping back (Bridging 10) 15 – 7 = 8 Seven is partitioned into 5 (to allow count back to 10) and 2.  Recongise that number sentences can be represented in several forms: 8 + 7 = 15 7 + 8 = 15 15 – 7 = 8 15 – 8 = 7 Solve missing number problems: 15 - ? = 8 ? – 7 = 8	Emphasise JUMP on number line, NOT counting! Use number bonds to jump back to the previous ten on the number line. Then subtract what is left in one jump. Use number bonds.

Using number line or hundred square to jump back from any number in steps of ten.	Jumping back in tens using number line.  Jumping back in tens using a hundred square. 	Starting from any 2-digit number children must be able to jump back in steps of ten. *Focus on what happens to the tens and units as you count.* *Focus on tricky parts: counting over 100, counting back past 20 in the teen numbers*.

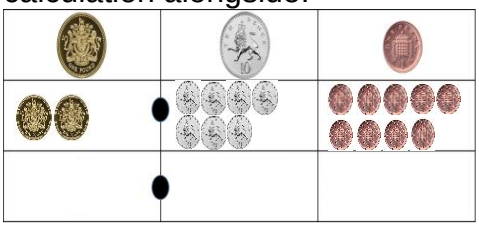
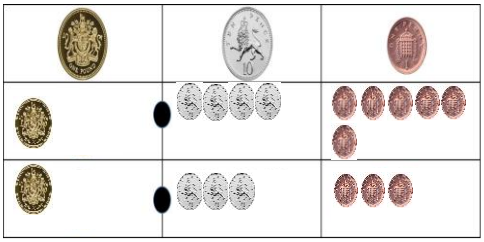
End of Year Age Related Expectation: Year 2

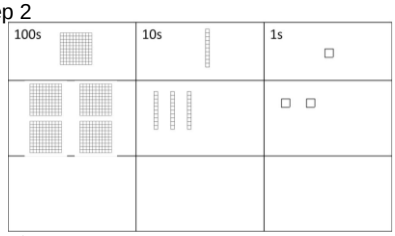
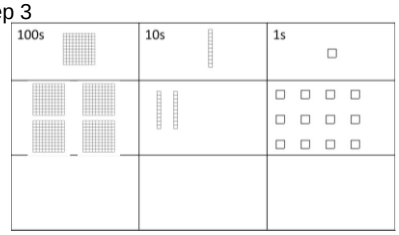
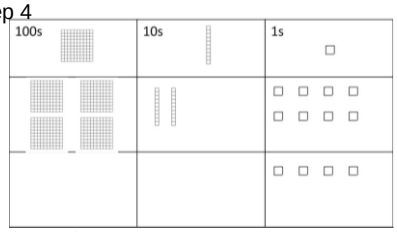
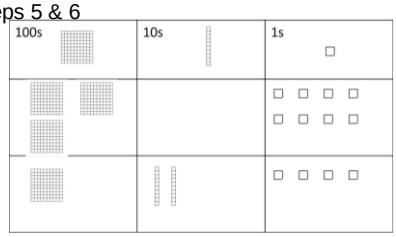
Subtracting on the number line by counting up (finding the difference)	TU – TU 74 – 27 = 47 worked by counting back:  74 – 27 = 47 worked by counting on:  The 'jumps' should be added, either mentally or with jottings according to confidence, beginning with the largest number e.g. 40 + 4 + 3. or  	Emphasise looking at HOW CLOSE NUMBERS ARE before using a number line. The children should question: Is it a good idea to take away? **OR** Is it a good idea to find the difference? THE NUMBER LINE REPRESENTS THE JUMPS IN YOUR HEAD! *If subtracting near multiples of ten, more confident pupils can do subtracting a ten and adjusting:* *43 - 19, = 43 - 20 = 23 +1 = 24*

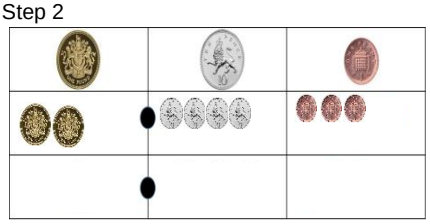
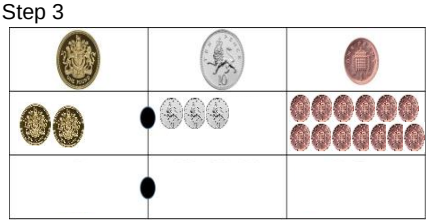
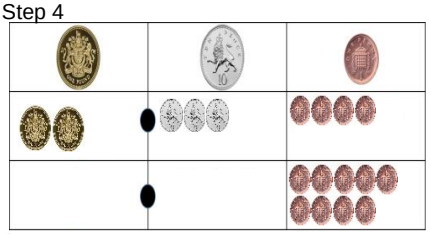
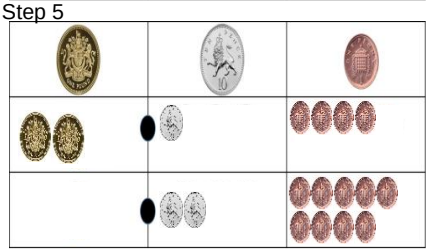
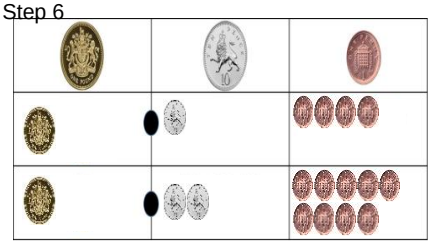
*End of Year Age Related Expectation: KS2**

Column subtraction for subtracting pairs of numbers not involving regrouping. ** 3 digits – Year 3* ** 4 digits – Year 4* ** more than 4 digits – Year 5 +*	HTU – HTU using decomposition 536 – 215 = 500 + 30 + 6 - 200 + 10 + 5 300 + 20 + 1 = 321 This will be introduced pictorially using bar models and practical equipment. *Bar Model* The bar model is used as a pictorial representation of the calculation, along with a number story *i.e.: I have 536 marbles in my bag. I gave my brother 215 marbles to play with. How many do I have left?* 536 215 | ? *Base-10 apparatus and calculation mat*  Calculation mat with written calculation alongside. 536 – 215 = ? Steps 1 & 2  536 - 215 Steps 3 & 4  536 - 215 321	Children will be familiar with solving subtraction on a number line with two steps. Once they reach step 27 in CLIC, they should be ready to do column methods. It is recognised that understanding is less important than efficiency and this is why it is important that they are securely numerate (at step 27) before beginning. They follow the progress drive through twelve steps. Do not use number line for HTU – HTU (only exception is something like 1,000 – 279, which would involve too many regroupings). Ideally children should only be using column method when practising decomposition. *Using the calculation mat:* 1. The number sentence is written as a column subtraction. 2. 536 is represented on the top row of the calculation mat in its partitioned form 6 ones, 3 tens and 5 hundreds). 3. Working from the right hand column, the 5 ones are moved down to the box below. 4. Repeated with tens and hundred column. 5. How much is left on the top row? Written calculations are completed alongside the equipment, with each step completed on the mat is then completed as a written method.

End of Year Age Related Expectation: Year 3

Column subtraction in the context of money not involving regrouping.	This will be introduced using bar models and number stories (as above) and practical equipment first. Calculation mat (money) with written calculation alongside.   £2.79 - £1.33 £1.46	Start by representing the numbers on the calculation mat so children understand the place value. The same method is used for calculating the answers as when using the Base-10 apparatus calculation mat (as detailed above). Written calculations are completed alongside the equipment, with each step completed on the mat is then completed as a written method.

Column subtraction for adding pairs of numbers involving regrouping. ** 3 digits – Year 3* ** 4 digits – Year 4* ** more than 4 digits – Year 5 +*	This will be introduced using bar models and number stories (as above) and practical equipment first. Calculation mat with written calculations alongside. Step 2  Step 3  $4\ ^{2}\cancel{3}\ ^{1}2$ $-\ 1\ 2\ 4$ Step 4  $4\ ^{2}\cancel{3}\ ^{1}2$ $-\ 1\ 2\ 4$ $\quad\quad 8$ Steps 5 & 6  $4\ ^{2}\cancel{3}\ ^{1}2$ $-\ 1\ 2\ 4$ $3\ 0\ 8$	Regrouping emphasis that the value of the number has not changed, eg: when a pupil regroups 12 ones into 1 ten and 2 ones the value of the number has not changes; the number has just be grouped in a different way. *Using the calculation mat:* 1. The number sentence is written as a column subtraction. 2. 432 is represented on the top row of the calculation mat in its partitioned form 2 ones, 3 tens and 4 hundreds). 3. Working from the right hand column, 2 is less than 4, so regroup 1 ten as 10 ones to make 12. 4. Subtract 4 ones from 12, moving the 4 ones to the box below. Leaving 8 ones on the top box. 5. Subtract the tens column (regrouping as in steps 2 & 3 if necessary). 6. Subtract the hundreds column (regrouping as in steps 2 & 3 if necessary). 7. How much is left on the top row? Written calculations are completed alongside the equipment, with each step completed on the mat is then completed as a written method.

Column subtraction in the context of money involving regrouping.	This will be introduced using bar models and number stories (as above) and practical equipment first. Calculation mat with written calculations alongside. £2.43 – £1.29 = ? Step 2  Step 3  £2.^{3}4^{1}3 - £1. 2 9 . . Step 4  £2.^{3}4^{1}3 - £1. 2 9 . 4 Step 5  £2.^{3}4^{1}3 - £1. 2 9 . 1 4 Step 6  £2.^{3}4^{1}3 - £1. 2 9 £1. 1 4	Regrouping emphasis that the value of the number has not changed, eg: when a pupil regroups 12 ones into 1 ten and 2 ones the value of the number has not changes; the number has just be grouped in a different way. *Using the calculation mat:* 1. The number sentence is written as a column subtraction. 2. £2.43 is represented on the top row of the calculation mat in its partitioned form 3 ones, 4 tens and 2 hundreds). 3. Working from the right hand column, 3 is less than 9, so regroup 1 ten as 10 ones to make 13. 4. Subtract 9 ones from 13, moving the 9 ones to the box below. Leaving 4 ones on the top box. 5. Subtract the tens column (regrouping as in steps 2 & 3 if necessary). 6. Subtract the hundreds column (regrouping as in steps 2 & 3 if necessary). 7. How much is left on the top row? Written calculations are completed alongside the equipment, with each step completed on the mat is then completed as a written method.

Compact column subtraction. ** 3 digits – Year 3* ** 4 digits – Year 4* ** more than 4 digits – Year 5 +*	This will be introduced using bar models and number stories (as above). 137 – 29 = ? $1^{2}\cancel{3}^{1}7$ - 2 9 1 0 8 Then with regrouping: 536 – 277 = ? $^{4}\cancel{5}^{12}\cancel{3}^{1}6$ - 2 7 7 2 5 9	As the children become more confident in column subtraction they can gradually start to use the compact method for speed. It is vital that they still understand that the '1' written above represents tens or hundreds.

End of Year Age Related Expectation: Year 5 +

Compact column subtraction with decimals.	This will be introduced using bar models and number stories (as above). Same number of decimal places: 72.5km – 14.6km = ? $^{6}\cancel{7}^{11}\cancel{2}.^{1}5$ - 1 4. 6 5 7. 9km Then numbers with different number of digits and decimal places: 936.43 – 79.5 = ? $^{8}\cancel{9}^{12}\cancel{3}^{15}\cancel{6}.^{1}43$ - 7 9. 50 8 5 6. 93	As with the compact column subtraction strategy it is vital that children understand what each column represents in terms of value.

Problem Solving

Throughout the progression of subtraction, once the children have mastered their age appropriate strategy, deepening their understanding of subtraction will be taught in context of real life situations through word problems.

Word problems, whether one step, two-step or multi-step, will be taught using the following acronym:

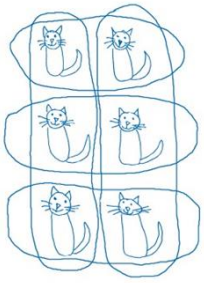
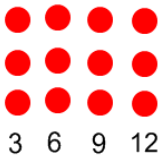
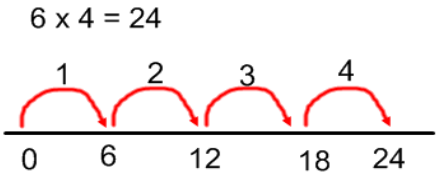
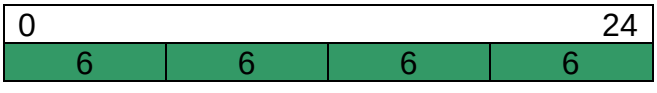
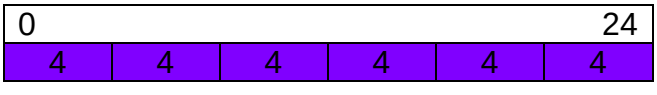
R **Read** the question.
I **Imagine** how you would solve the problem.
T **Talk** to your partner about how you would solve the problem.
A **Action** the problem through using maths equipment (i.e. real life objects, number rods, Base-10 apparatus).

D **Draw** a diagram (i.e. a bar model).

or

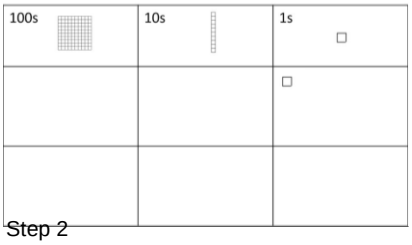
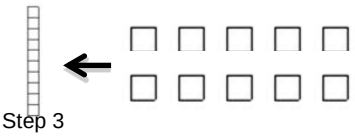
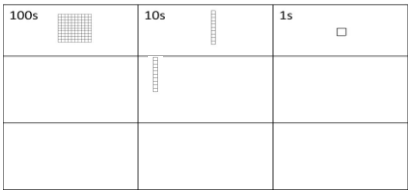
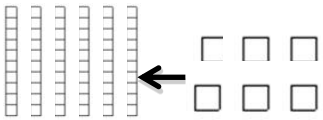
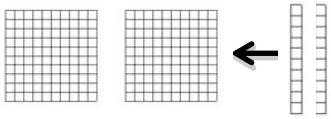
R **Read** the question
U **Understand** the problem
C **Choose** the number operation to use to solve the problem
S **Solve** the problem
A **Answer**
C **Check** the answer.

X Multiplication X

STEP	Concept & images	Comments
End of Year Age Related Expectation: Year 1		
Repeated addition.	5 x 3 = 15 is the same as 5 + 5 + 5 = 15  2 + 2 + 2 + 2 + 2 = 10	The main concept to get across is that when you multiply you are repeatedly adding the same number again and again. Counters can be used to illustrate this clearly.
End of Year Age Related Expectation: Year 2		
Simple Multiplication (repeated addition).	Array 3 groups of 2 or 2 groups of 3  3 x 4 = 12  3 6 9 12 4 x 3 = 12  4 8 12 Number line  6 x 4 = 24 1 2 3 4 0 6 12 18 24 Bar Models  0 24 6 6 6 6  0 24 4 4 4 4 4 4	Read out the calculations as: 3x4 '3, multiplied 4 times' Understand that this is a group of 3, repeated 4 times. Use an array to model the concept. Emphasise that children do not count individual dots, but count up in the appropriate steps. This can lead onto children representing their counting on a number line.

Doubling.	8 x 2 = 16 *(double the units)* 24 x 2 = 48 *(double the tens, double the units, combine)* 8 x 4 = 32 *(can use double, then double again)*	It is important that doubling and halving are taught independently to other mental strategies for multiplying and dividing. It is not appropriate for children to use arrays or number lines to multiply by 2. Children should be able to double, even large numbers through partitioning, mentally.

End of Year Age Related Expectation: Year 3

Multiplying by 10 and 100.	*Base-10 apparatus and calculation mat*  Step 1  Step 2  Step 3  26 x 10 = ?   Then moving onto multiply by 10 / 100 without the Base-10 and calculation mat. 79 x 10 = 790 79 x 100 = 7900	Similar to doubling, children should be able to multiply by ten mentally. They need to do this in order to solve larger multiplication calculations effectively. Emphasise the DIGITS MOVE, not adding on a zero when x by 10 (otherwise, when working with money, children will put £1.75 x 10 = £1.750). Using the calculation mat: 1. Show the pupil 1 ones. 2. Multiply by 10, so you have 10 ones. 3. Regrouping into 1 ten into the tens column.

End of Year Age Related Expectation: Year 3

<table>
<tr>
<td>Multiplying 2-digit by a 1-digit number.</td>
<td>
This will be introduced by using number rods, bar models and number stories.

13 x 3 = ?

Number story

Each of my 3 friends has 13 apples. How many do they have altogether?

Bar model

<table>
<tr><td>13</td><td>13</td><td>13</td></tr>
<tr><td colspan="3">?</td></tr>
</table>

Numbers rods to form an array

<table>
<tr><td>10</td><td>3</td></tr>
<tr><td>10</td><td>3</td></tr>
<tr><td>10</td><td>3</td></tr>
</table>

The array can then be added together:
10+10+10= 30, 3+3+3=9
30 + 9 = 39

Grid Method

<table>
<tr><td>x</td><td>10</td><td>3</td></tr>
<tr><td>3</td><td></td><td>9</td></tr>
</table>

<table>
<tr><td>x</td><td>10</td><td>3</td></tr>
<tr><td>3</td><td>30</td><td>9</td></tr>
</table>

30 + 9 = 39

Solve missing number problems:

5 x ? = 20
? x 9 = 27
</td>
<td>The grid method allows children to use known number facts to solve multiplication problems.</td>
</tr>
</table>

*End of Year Age Related Expectation: KS2**

Column Short Multiplication. ** 2-digit by 1-digit number – Year 3* ** 3-digit by 1-digit number – Year 4* ** 2-digit by 1-digit number – Year 5 +*	This will be introduced as detailed above using number stories, bar models and arrays. *Grid method with expanded method of short multiplication alongside:* 24 x 6 = ? Step 1 x | 20 | 4 6 | | Step 2 x | 20 | 4 6 | | 24 Step 3 x | 20 | 4 6 | 120 | 24 24 x 6 24 120 Step 4 24 x 6 24 120 144 *Compact method of short multiplication:* 24 x 6 = ? 342 x 7 = ? 2741 x 6 = ? 24 x 6 = 144 (2) 342 x 7 = 2394 (21) 2741 x 6 = 16446 (42)	The multiplication Progress Drive for Column methods has 11 steps. Children can begin column methods when they have reached step 11 in CLIC. This runs alongside the FAB methods. The children are encouraged to learn their multiplication facts – known as Learn Its in a progressive way and know their related division facts e.g. Y3 children that are on track should be on step 10 – three times tables. As soon as they know 3 x 4 = 12 they learn 4 x 3 = 12 (known as a switcher). The short multiplication encourages children to use known multiplication facts when solving larger multiplication calculations. *This will also help them when dividing.* *Using the grid method:* 1. Draw the grid, then partition each 24 into ten and ones showing that there a 6 lots. Alongside write the column method. 2. Multiply 4 by 6 (24). 3. Multiply 20 by 6 (120) 4. Add 24 and 120 together (either mentally or using written calculations as detailed in the addition section of this policy. Children can begin to use the compact methods when they are comfortable with solving the multiplications mentally.

End of Year Age Related Expectation: Upper KS2*

Column Long Multiplication. ** 4-digit by 2-digit number – Year 5 +*	This will be introduced as detailed above using number stories and bar models. *TU x TU Grid method with expanded long multiplication column method alongside:* 21 x 13 = ? Step 1 x | 20 | 1 10 | | 3 | | 21 x 13 Step 2 x | 20 | 1 10 | | 3 | 60 | 3 21 x 13 63 Step 3 x | 20 | 1 10 | 200 | 10 3 | 60 | 3 21 x 13 63 210 Step 4 21 x 13 63 +210 273 *HTU x TU Grid method with long multiplication column method alongside:* 321 x 24 = ? Step 1 x | 300 | 20 | 1 20 | | | 4 | | | 321 x 24 Step 2 x | 300 | 20 | 1 20 | | | 4 | 1200 | 80 | 4 321 x 24 1284 Step 3 x | 300 | 20 | 1 20 | 6000 | 400 | 20 4 | 1200 | 80 | 4 321 x 24 1284 6420 Step 4 321 x 24 1284 +6420 7704 1 The same method is used to calculate a 4-digit method multiplied by a 2 digit number.	*Using the grid method:* 1. Draw the grid, then partition each 21 into tens and ones and 13 into tens and ones. Alongside write the column method. 2. Multiply 1 by 3 (3), and then 20 x 3 (60). Record on the column method as 63 (60+3). 3. Multiply 1 x 10 (10), then 20 by 10 (200). Record on the column method as 210 (200 + 10). 4. Add 63 and 210 together (either mentally or using written calculations as detailed in the addition section of this policy.

	Compact method of long multiplication: 24 x 16 = ? 342 x 27 = ? 2741 x 33 = ? 24 x 16 = 144 + 240 = 384 (12) 342 x 27 = 2394 + 6840 = 9234 (21) 2741 x 33 = 8223 + 82230 = 90453 (21, 1)	Children can begin to use the compact methods when they are comfortable with solving the multiplications mentally.

End of Year Age Related Expectation: Year 6

Multiplying by decimals 10, 100, 1000.	Multiply by 10 / 100 / 1000 0.79 x 10 = 7.9 0.79 x 100 = 79 0.79 x 1000 = 790 Th H T U . tenths 7 . 9 x 10 (digits move one column to left) 7 9 . 0 x 100 (digits move two columns to left) 7 9 0 . 0 x 1000 (digits move three columns to left)	Similar to doubling, children should be able to multiply by ten mentally. They need to do this in order to solve larger multiplication calculations effectively. Emphasise that the number is getting 10, 100 or 1000 time bigger. The DIGITS MOVE, not adding on a zero when x by 10 (otherwise, when working with money, children will put £1.75 x 10 = £1.750). Zero as a place holder.

Multiplying Decimals.	14.53 x 4 = 58.12 *Grid method:* x **10** **4** **0.5** **0.03** **4** 40 16 2 0.12 *Short multiplication method:* 14.53 x 4 = 58.12 (1 2 1)	

Problem Solving

Throughout the progression of multiplication, once the children have mastered their age appropriate strategy, deepening their understanding of multiplication will be taught in context of real life situations through word problems.

Word problems, whether one step, two-step or multi-step, will be taught using the following acronym:

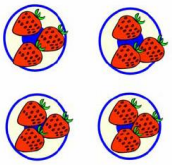
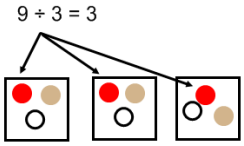
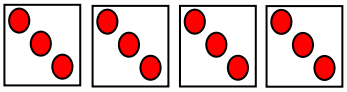
R **Read** the question.
I **Imagine** how you would solve the problem.
T **Talk** to your partner about how you would solve the problem.
A **Action** the problem through using maths equipment (i.e. real life objects, number rods, Base-10 apparatus).

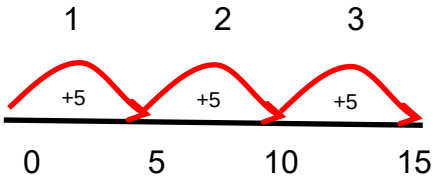
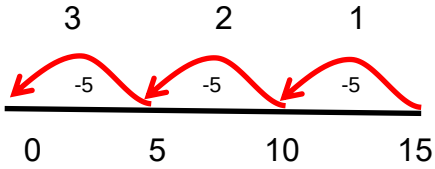
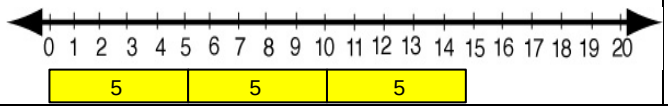
D **Draw** a diagram (i.e. a bar model).

or

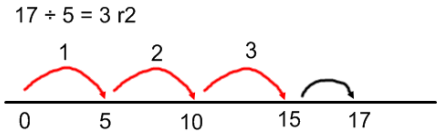
R **Read** the question
U **Understand** the problem
C **Choose** the number operation to use to solve the problem
S **Solve** the problem
A **Answer**
C **Check** the answer.

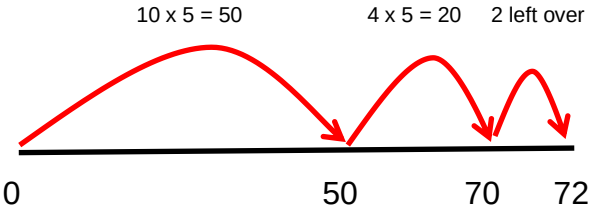
÷ Division ÷

STEP	Concept & images	Comments
End of Year Age Related Expectation: Year 1		
Sharing.	SHARING 'Is it fair?' Introduced through number stories, objects and pictorial representations. i.e.: I picked 12 strawberries. Can you share them between 4 friends?  Can you share these 9 counters between 3 groups? 	USE COUNTERS OF DIFFERENT COLOURS. When sharing you know how many groups you will have; you are working out how many will be in each group.
End of Year Age Related Expectation: Year 2		
Grouping.	Introduced through number stories, objects and pictorial representations. As GROUPING – link to times tables facts 12 ÷ 4 = 3 	When solving division through grouping, you know how many items are in each group; you are working out how many groups there will be. As this relies more on times tables knowledge, it is better to use this strategy than sharing. Children should understand that even when solving a 'sharing' problem, they can solve it quicker through grouping.

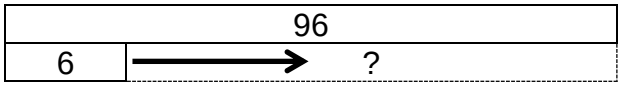
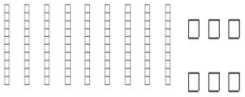
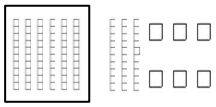
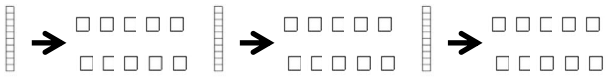
Grouping on the number line.	Introduced through number stories, objects and pictorial representations. Grouping using number line (repeated addition) 15 ÷ 5 = 3  Grouping using number line (repeated subtraction) 15 ÷ 5 = 3  Number line and rods 15 ÷ 5 = 3  	Encourage children to read the question as: *'I have 15, how many 5s?'* They can then use times tables knowledge to solve the problem, using number lines to record their thinking.
Halving	8 ÷ 2 = 4 *(half the units)* *16* ÷ 2 = 8 *(half the tens, half the units, then combine)*	It is important that doubling and halving are taught independently to other mental strategies for multiplying and dividing. Children should be able to half, even large numbers through partitioning, mentally.

End of Year Age Related Expectation: Year 3

Grouping with remainders.	Finding a remainder 17 ÷ 5 = 3 r 2  This method can be taught both as division as repeated addition or repeated subtraction (as shown above in point 3).	Encourage children to read the question as: 'I have 17, how many groups of 5 can I get out of 17?' How many WHOLE groups of 5 can they count in 17? What's left over? *This is the remainder.*
Dividing by 10 / 100.	Dividing by 10 / 100 790 ÷ 10 = 79 7900 ÷ 10 = 790 7900 ÷ 100 = 79	

Dividing 2-digt by 1-digit number.	Use 'further' partitioning on a number line/chunking. 72 ÷ 5 = ?  Solve missing number problems: 39 ÷ ? = 13 ? ÷ 3 = 13	Further partitioning allows children to break a large number down so that they can use known multiplication facts to help solve the division. Eventually further partitioning may not be necessary as children become more confident seeing the multiplication facts they can use.

End of Year Age Related Expectation: KS2*

Short division. *2-digit ÷ 1-digit – Year 3 *3-digit ÷ 1-digit – Year 4 *4-digit ÷ 1-digit – Year 5 +	This will be introduced using numbers stories bar models and equipment. *Number story* I have 96 sweets and 6 friends to share them among. How many sweets will each of my friends get? *Bar Model*  *Base-10 apparatus with written short division (with regrouping and remainders)*  *96* ÷ 6 = ? *Step 1*: Make 96 with the Base-10 apparatus, with written calculation alongside.  $6\overline{)96}$ Step 2: Starting with the tens – how many groups of 6 tens can be made from 9 tens?  $\begin{array}{r}1\\6\overline{)9\,^{3}6}\end{array}$ *Step 3*: You cannot make any more groups of 6 tens from 3 tens, so regroup into 30 ones. 	Children start column methods when they reach division step 19 in CLIC. There are 10 steps in the progress drive for division column methods. Using the standard 'goes into' method allows children to use known multiplication facts mentally and reduce the jottings needed to record their thoughts.

Step 4: How many groups of 6 ones can we you make with 36?

□ □ □ □ □ □ *one group of 6 ones*
□ □ □ □ □ □ *one group of 6 ones*
□ □ □ □ □ □ *one group of 6 ones*
□ □ □ □ □ □ *one group of 6 ones*
□ □ □ □ □ □ *one group of 6 ones*
□ □ □ □ □ □ *one group of 6 ones*

$$6\overline{)9^{3}6}\quad 1\ 6$$

This methods can also been followed from teaching dividing up a 4-digit number by a 1-digit number.

Short division expanded method (chunking)

```
   24 r1
3 | 73
  - 30 (10 x 3)
    43
  - 30 (10 x 3)
    13
  - 12 (4 x 3)
     1
```

Short division semi-compact method

```
   59 r3
6 | 357
    30    (5 x 6 = 30)
    57    (9 x 6 = 54)
     3
```

Short division compact method
98 ÷ 7 = ?

```
   1  4
7 | 9 2 8
```

1. 9 ÷ 7 = 10 r20
2. Regroup 2 into ones column.
3. 28 ÷ 7 = 4

Short division method with remainders
432 ÷ 5 = ?

```
    8  6 r2
5 | 4 4 3 3 2
```

1. 4 ÷ 5 = cannot go, so regroup 4 into tens column.
2. 43 ÷ 5 = 8 r3.
3. Regroup 3 into ones column.
4. 32 ÷ 5 = 6 r2.

Short division method with remainders shown as fractions
432 ÷ 5 = ?

```
    8  6 r2
5 | 4 4 3 3 2
```

The answer is $86\ ^{2}/_{5}$

End of Year Age Related Expectation: Year 6		
Long division.	*Long division method (chunking)* 972 ÷ 36 = ? 2 7 36 | 9 7 2 - 3 6 0 (10 x 36) ~~6~~ 1 2 - 3 6 0 (10 x 36) 1 5 2 - 1 8 0 (5 x 36) 7 2 - 7 2 (2 x 36) 0 0 or 425 ÷ 25 = ? 0 1 7 25 | 4 2 5 - 0 (0 x 25) 4 2 - 2 5 (1 x 25) 1 7 5 - 1 7 5 (7 x 25) 0 0 0 <u>Long division with remainders</u> 432 ÷ 15 = ? 2 8 r12 15 | 4 3 2 - 3 0 0 (20 x 15) 1 3 2 - 1 2 0 (8 x 15) 1 2 <u>Long division with remainders as fractions</u> 432 ÷ 15 = ? 2 8 15 | 4 3 2 - 3 0 0 (20 x 15) 1 3 2 - 1 2 0 (8 x 15) 1 2 $^{12}/_{15}$ simplified to $^{4}/_{5}$ Answer = $28^{4}/_{5}$	

	Long division with remainders as decimals 432 ÷ 15 = ? 28.8 15 | 432.0 - 30 132 - 120 120 120 0 Answer = 28.8	
Decimal Divisions	With decimals: Using short division 87.5 ÷ 7 = 12.5 7 | 87.5 1 3	

Problem Solving

Throughout the progression of division, once the children have mastered their age appropriate strategy, deepening their understanding of division will be taught in context of real life situations through word problems.

Word problems, whether one step, two-step or multi-step, will be taught using the following acronym:

R **Read** the question.
I **Imagine** how you would solve the problem.
T **Talk** to your partner about how you would solve the problem.
A **Action** the problem through using maths equipment (i.e. real life objects, number rods, Base-10 apparatus).

D **Draw** a diagram (i.e. a bar model).

or

R **Read** the question
U **Understand** the problem
C **Choose** the number operation to use to solve the problem
S **Solve** the problem
A **Answer**
C **Check** the answer.

Summary

- Children should always be encouraged to estimate first using rounding.
- Always check the answer, preferably using a different method e.g. the inverse operation.
- Always decide first whether a mental method is appropriate.
- Pay attention to language - refer to the actual value of digits.
- Children should progress through progress drives and not move on until secure (occasionally, children may need to revisit previous steps when encountering difficulties).
- Children need to learn their LEARN ITS as part of the Big Maths scheme.
- Ensure that as children progress, they are still working on mental strategies and along the FAB continuum.
- Homework should reinforce teaching and learning in school.