Chulmleigh Academy Trust Primary Schools

Calculation Policy March 2022

INTRODUCTION

This Maths and Calculation Policy has been produced in line with the 2014 National Curriculum for Mathematics to ensure consistency and progression in teaching throughout the school that is age appropriate. It aims to introduce children to the processes of calculation through practical, oral and mental activities following the White Rose scheme of work. As children begin to understand the underlying ideas, they develop ways of recording to support their thinking and calculation methods. This policy shows the natural progression that a child should make in their mathematical education. Children should not progress onto the advanced stages of formal written methods until they have a secure conceptual understanding. By the end of Year 6, children should be able to choose the most appropriate approach to solve a problem: making a choice between using jottings (an extended written method), an efficient written method or a mental method.

Intent
Maths is a journey and long-term goal, achieved through exploration, clarification, practice and application over time. At each stage of learning, children should be able to demonstrate a deep, conceptual understanding of the topic and be able to build on this over time. Our overall aims for when children leave Chulmleigh Academy Primary schools are: ● develop a positive attitude to mathematics as an interesting subject in which all children gain success and pleasure and make links in their understanding. ● have access to a high quality maths curriculum that is both challenging and enjoyable, builds upon previous learning and allows them to implement their prior understanding. ● be provided with a variety of mathematical opportunities, which will enable them to make the connections and apply in other subjects. ● ensuring children are confident mathematicians who are not afraid to take risks and ask questions. ● develop an ability to use correct the mathematical language and vocabulary and apply it in maths every lesson through maths talk, introduction every lesson and displayed on working wall. ● develop mathematical skills and knowledge and recall of basic facts and the four operations with the use of planned arithmetic lessons and use of online websites such as TTRS. ● be able to use this knowledge and understanding to carry out calculations mentally when necessary ● make use of diagrams and informal notes (jottings) to help record steps and part answers when using mental methods that generate more information than can be kept in their heads ● have an efficient, reliable, compact written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally. 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 of a formal written method?
Implementation
Our implementation is developed through secure understanding of the curriculum and subject area. We follow the scheme of White Rose Maths to guide our planning throughout the year and adapt accordingly to class needs. . Teachers have access to a variety of websites and planning to support their planning process which enables them to find high quality Maths resources. **Planning** Planning is undertaken at three levels:

1. Long term: National Curriculum

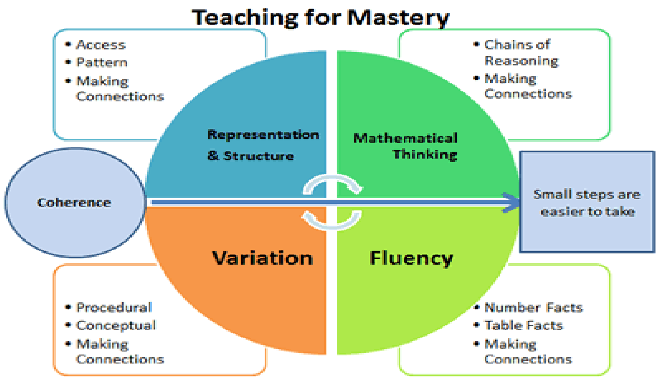
The National Curriculum 2014 has 3 central aims:

- Become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately. In order to achieve this we need to provide opportunities for children to investigate numbers by counting, cardinality (how many there are in the group), comparison and composition. They need to practice decomposing and recomposing numbers, recalling number bonds and multiplication tables to improve mathematical fluency.

- **Reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language. The conversations we have and questions we ask are key to developing reasoning skills. We can ask children to describe, explain, convince others, justify and prove to promote their reasoning skills. Adults can support children to develop reasoning by modelling, using mathematical language (also displayed in classrooms), using sentence stems (displayed and referred to on the front covers of the Maths books), group work, Cooperative learning CLIPs, understanding how others work and making personal notes and recordings.

- Can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions. Activities should be provided where children can solve number problems, practical problems and missing number problems. Problem solving is not just about solving the problem, it is about ***how*** they solved the problem. ***What*** strategies and mathematical concepts did they use? All pupils should have the opportunity to apply their mathematics to solve problems. The use of mathematical language and modelling can all help support children to develop their problem solving skills. Higher attaining children need to solve problems that require more demanding reasoning and problem solving skills rather than harder numbers. We must ensure that children have the opportunity to conjecture when problem solving. Problem solving is more than learning and following a procedure.

Planning also links to the NCETM 5 Big Ideas where each lesson incorporates each idea.



Coherence Lessons are broken down into small connected steps that gradually unfold the concept, providing access for all children and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts. Representation and Structure Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation Mathematical Thinking If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others Fluency Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics Variation Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure

2. Medium term

The sequencing of teaching reflects the needs of the learners. Place value and arithmetic are given priority at the start of each academic year as these are the building

blocks for mathematical learning. Here on, it is an ongoing formative assessment and analysis process of curriculum objectives (use of White Rose) that results in the learning being planned for and delivered in direct correlation to assessment findings.
The use of S planning allows teacher to plan out the learning journey for each area being taught which allows teachers to think about activities, prior learning, vocabulary and potential misconceptions.

3. Short term planning

Short term planning is carried out weekly by the class teacher supported by the use of many different websites and our Calculation Policy. These plans list the specific learning objectives and details of how the lessons are to be taught, including key vocabulary. The structure of a lesson is as follows:

- Recap – recapping prior learning from the previous lesson and incorporating fluency.
- Guided Practice – Teacher input (main teaching part of the lesson) but also involves child involvement (ping pong approach which links to the Mastery Maths approach to teaching maths) This is also where key vocabulary for the lesson is introduced as well as the Anchor task for the lesson.
- Independent learning- This is where children complete a given task relating to the lesson and relevant children are guided/supported depending on teacher judgment.
- Plenary – revisiting of the Anchor Task and possible opportunities for children to demonstrate reasoning skills.

Concrete, pictorial and Abstract (CPA) approach

At Chulmleigh Academy primary schools, we recognise that the **Concrete Pictorial Abstract (CPA)** approach is highly effective in the teaching of Maths to develop conceptual understanding. This approach will vary between year groups and the individual abilities of children within each class.

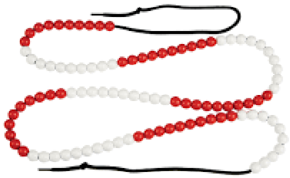
The mastery approach incorporates the use of objects, images, words, numbers and symbols to help children explore and demonstrate mathematical ideas, rich mathematical vocabulary, enrich their learning experience and deepen understanding. Together, these elements help cement knowledge so pupils truly understand what they've learnt.

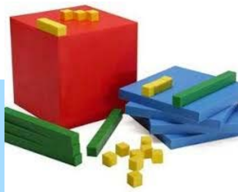
All pupils, when introduced to a key new concept, should have the opportunity to build competency in this topic by taking this approach. Pupils are encouraged to physically represent mathematical concepts. Objects and pictures are used to demonstrate and visualise abstract ideas, alongside numbers and symbols.

Concrete – The doing stage

There is a clear focus on the use of manipulatives and visual images to support understanding in every year group. Each new concept or calculation strategy will be introduced using appropriate manipulatives, giving the children a clear picture of the mathematics they are learning. It is important that children have access to a wide range of manipulatives in every year group and, consequently, we encourage children to be independent in their use of manipulatives throughout the school and access resources as they see fit. This is the foundation for conceptual understanding.

Concrete resources that may be found in classrooms will include:

These resources will vary depending on year group and individual needs.

<u>Pictorial – The seeing stage</u>

A child has sufficiently understood the hands-on experiences performed and can now relate them to representations, such as a diagram or a picture of the problem.

<u>Abstract- The symbolic stage</u>

A child is now capable of representing problems by using mathematical notation, for example 10 ÷ 2 = 5

Teaching

‘Quality first teaching’ linked to teaching standards:
All teachers:

1. ‘Know where their children are’ through the use of summative assessment, prior learning, assessment, maths/learning talk
2. ‘Understand where their children need to be’ through a secure understanding of year group expectations and/or pre key stage expectations and ongoing, formative assessment
3. ‘Know how they are going to get them there’ through the use of a range of strategies to promote independence, mastery and high expectations of ALL.
4. Effectively deploy adults, specifically during introductions, plenaries & catch-up sessions
5. Plan for progression during and between lessons.

Assessment

1. Summative/reported - (EYFS, Yr 2, Yr 6)
2. Standardisation (Year 1 – 6) – Termly/half termly assessments for each year group (NTS and Sats papers)
3. Formative – Giving feedback in marking to support understanding
4. Children identified for PPD

Impact

Pupils will leave us prepared for the next stage in their lives with:

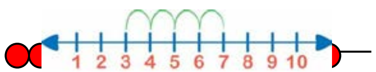
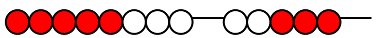
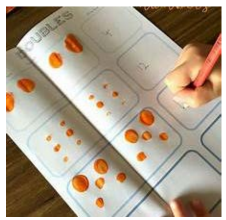
- Quick recall of facts and procedures
- The flexibility and fluidity to move between different contexts and representations of mathematics
- The ability to recognise relationships and make connections in mathematics
- Confidence and belief that they can achieve

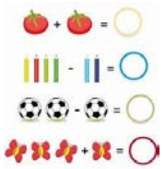
- Skills and concepts that have been mastered
- Have a positive and inquisitive attitude to mathematics as an interesting and attractive subject in which all children gain success and pleasure.

A mathematical concept or skill has been mastered when a child can show it in multiple ways, using the mathematical language to explain their ideas, and can independently apply the concept to new problems in unfamiliar situations and this is the goal for our children.

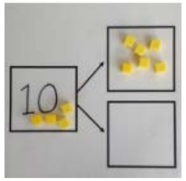
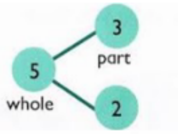
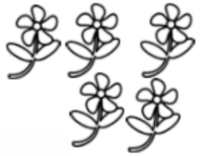
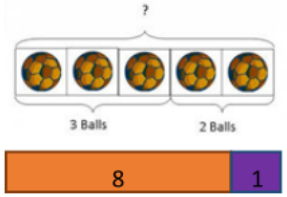
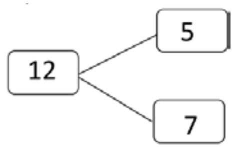
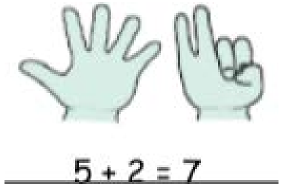
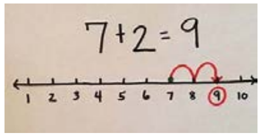
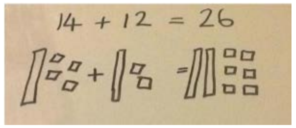
These will be assessed through: assessment, tracking, pupil progress meetings and moderations.

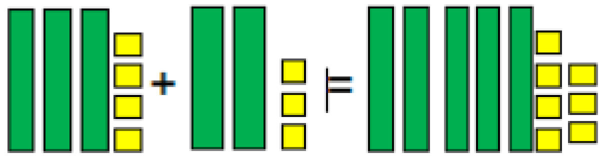
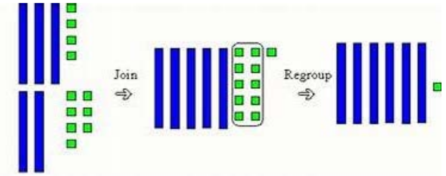
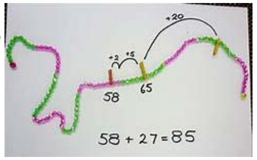
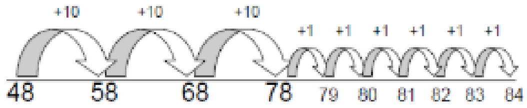
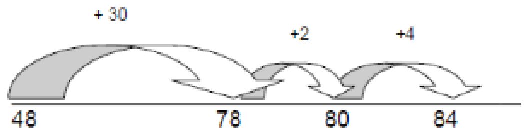
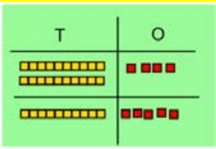
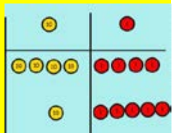
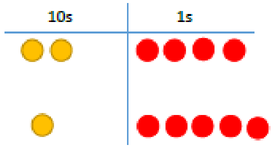
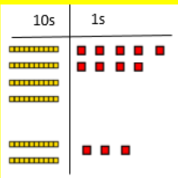
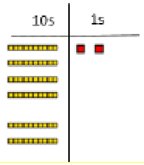
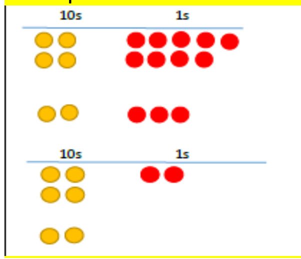
Calculation Policy

EYFS (Nursery & Reception)			
Addition	Subtraction	Multiplication	Division
Children are encouraged to gain a sense of the number system through the use of counting concrete objects.   They combine objects in practical ways and count all.  They understand addition as counting on and will count on in ones and twos using objects, cubes, bead string and number line.  They use concrete and pictorial representation to record their calculations.	Children are encouraged to gain a sense of the number system through the use of counting concrete objects.   They understand subtraction as counting out.  They begin to count back in ones and twos using objects, cubes, bead string and number line.   They use concrete and pictorial representation to record their calculations.	Children use concrete objects to make and count equal groups of objects.  They will count on in twos using a bead string and number line. They understand doubling as repeated addition. 2 + 2 = 4 They use concrete and pictorial representation to record their calculations.  Higher attaining children may be able to represent their calculations using symbols and numbers within a written calculation.	Children use concrete objects to count and share equally into 2 groups. 6 cakes shared between 2 people each person gets 3 cakes. 6 ÷2 = 3   They count a set of objects and halve them by making two equal groups. They understand sharing and halving as dividing by 2. They will begin to use objects to make groups of 2 from a given amount. They use concrete and pictorial representation to record their calculations.

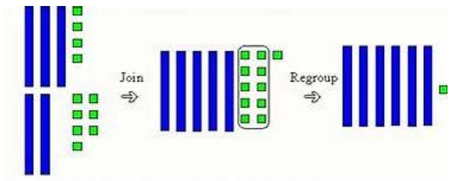
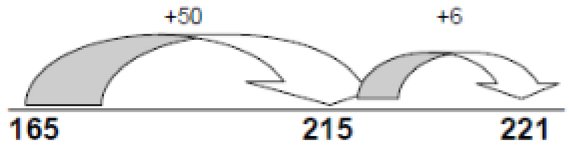
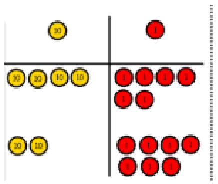
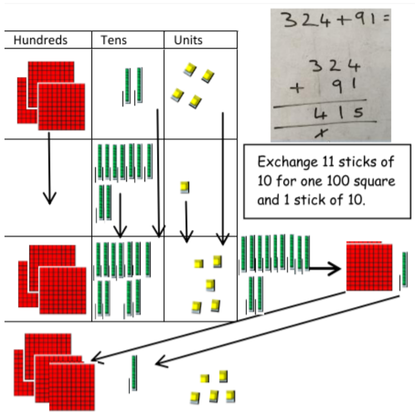
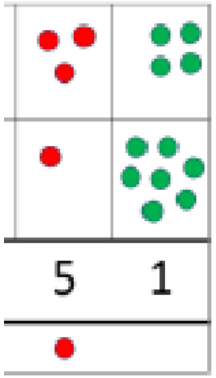
They begin to use + and =  They are encouraged to develop a mental picture of the number system in their heads to use for calculations. Higher attaining children may be able to represent their calculations using symbols and numbers within a written calculation.	They begin to use - and = They are encouraged to develop a mental picture of the number system in their heads to use for calculations. Higher attaining children may be able to represent their calculations using symbols and numbers within a written calculation.		 Higher attaining children may be able to represent their calculations using symbols and numbers within a written calculation.

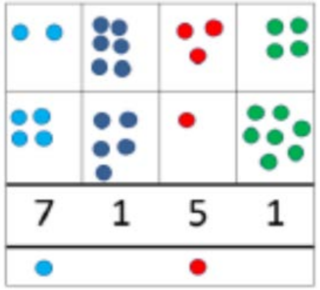
Calculation Policy

ADDITION - KS1 (Years 1&2)			
	Concrete	Pictorial	Abstract
Stage 1	Use part part whole model, cubes and bead strings to add two numbers together as a group or in a bar.     	Use jottings to represent numbers.    Use pictures to add two numbers together as a group or in a bar.	Children will record their calculation using a pictorial method along with a calculation using numbers and symbols.  11 + 4 = 15 They may use their fingers to support their mental methods 
Stage 2	**Grouping objects to add** Children will use dienes cubes to add larger numbers where regrouping is not required. They will also use a bead string to add larger numbers by counting in tens and ones	**Number line** Start at the larger number on the number line and count on in ones or in one jump to find the answer. Children will show their representations from the concrete method using pictures.   	Children will record their calculation using a pictorial method along with a calculation using numbers and symbols. Children will begin to add multiples of tens. 27 + 10 = 37 27 + 20 = 47 27 + □ = 57

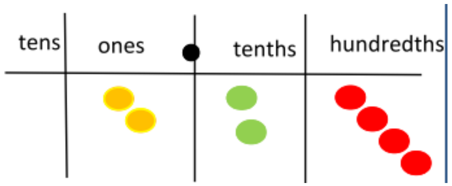
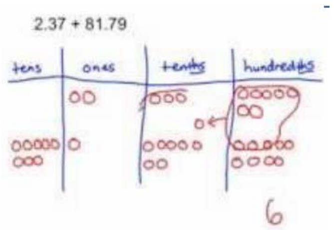
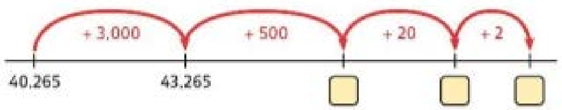
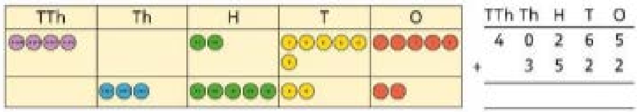
		Numbers will get progressively larger throughout the keystage. Children will be able to add tens and ones using an empty number line.	
Stage 3	**Partitioning** Children will add larger numbers where they will need to join, regroup and count.  Children will also use bead strings to add numbers together using groups of tens and ones to count on. 	**Number line** Use an empty number line to count in tens and then ones.  When confident: 	**Partitioning** Children will begin to use the partitioning method. Tens and ones will be added to form partial sums and then these partial sums will be added together to find the total. 25 + 47 20 + 5 40 + 7 20 + 40 = 60 5+ 7 =12 60 + 12 = 72
In line with the WR scheme to lead onto column addition with and without regrouping.	Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters. 24 + 15 = 44 + 15 = 	After physically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions. 	24 + 15 = 39 24 + 15 39
	Make both numbers on a place value grid  Add up the units and exchange 10 ones for 1 ten. 	Using place value counters, children can draw the counters to help them to solve additions. 	40 + 9 20 + 3 60 + 12 = 72

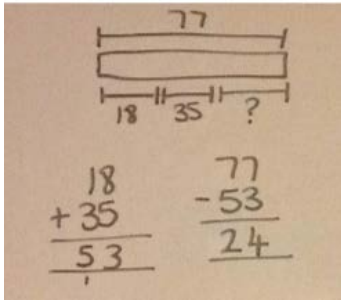
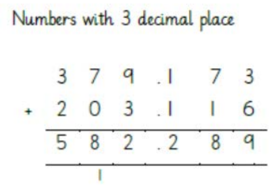
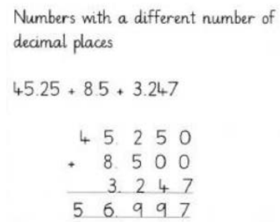
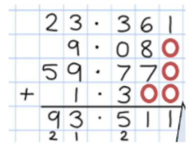
Calculation Policy

ADDITION - Lower KS2 (Years 3 & 4)			
	Concrete	Pictorial	Abstract
Stage 1	Use dienes cubes to consolidate learning from KS1. Ensure children are confident at using these to join, regroup and count. This will support them moving onto the next stage of column addition.  	**Number line** Consolidate their learning from KS1 by using an empty number line to count larger numbers.  	**Partitioning** Children will consolidate using the partitioning method. The layout will begin to form a written method to support further progress onto the column method. Hundreds, Tens and ones will be added to form partial sums and then these partial sums will be added together to find the total. 200 + 60 + 3 + 100 + 10 + 9 300 + 70 + 12 300 + 80 + 2
Stage 2	Introduce children to place value counters and dienes cubes. Use the column method layout to support their learning onto the abstract method.   	Children can draw a representation of the grid to further support their understanding, carrying the ten underneath the line.  	**Expanded column method - Formal method** Children to use the Expanded Column Method. Start by partitioning the numbers before the formal column to show the exchange. Once confident, they can move onto the column method in stage 3. 176 + 147 13 (7 + 6) + 110 (70 + 40) 200 (100 + 100) 323 147 + 176 323 1 1

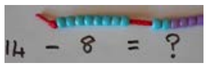
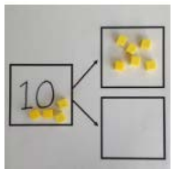
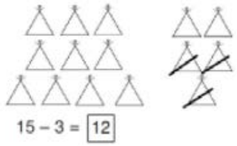
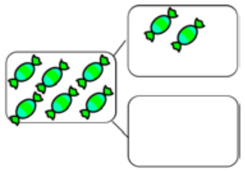
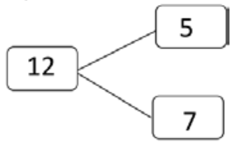
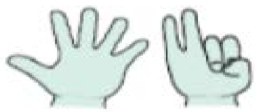
Stage 3	Children will add larger numbers where they will need to exchange place value counters or dienes cubes. 	Children can draw a representation of the grid using larger numbers.  	**Column method - Formal method** Column Method for addition to be used with more than one exchange. $\begin{array}{r} 4\,4\,7\,8 \\ +\ 3\,7\,6\,2 \\ \hline 8\,2\,4\,0 \end{array}$

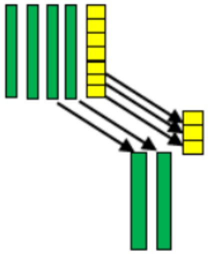
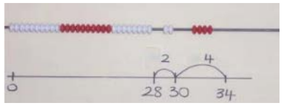
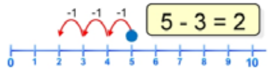
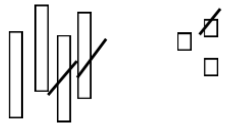
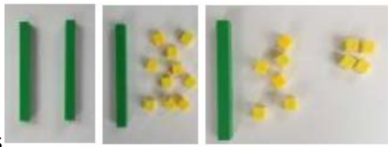
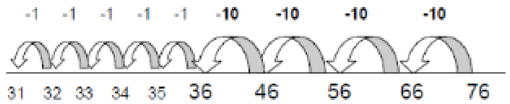
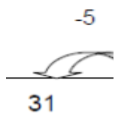
Calculation Policy

ADDITION - Upper KS2 (Years 5 & 6)			
	Concrete	Pictorial	Abstract
Stage 1	Introduce decimal place value counters and model regrouping for addition.  	Children will draw their representations showing where they have regrouped.    	**Column method** Children will continue to develop their understanding of column method addition. Calculations will become larger and include decimal places. $\begin{array}{r} 379.173 \\ +\ 203.116 \\ \hline 582.289 \end{array}$

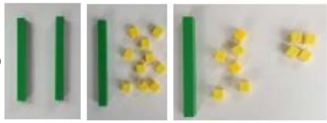
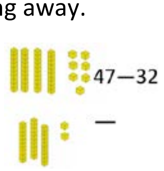
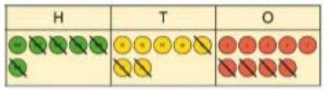
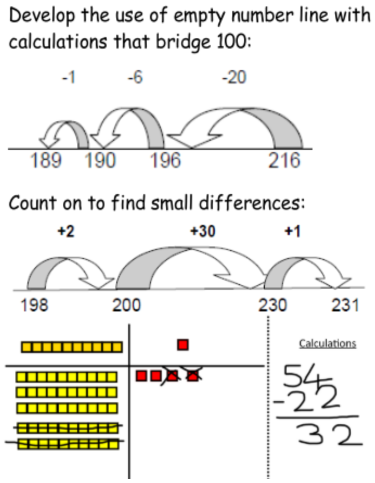
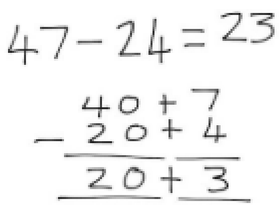
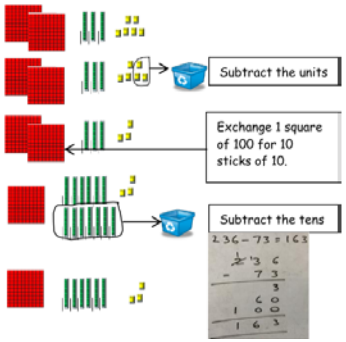
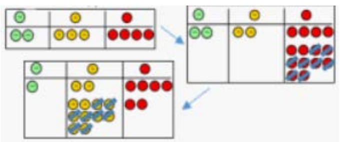
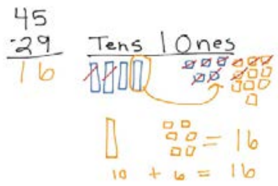
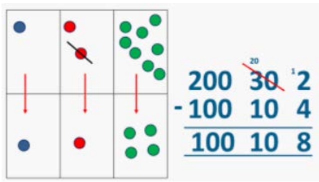
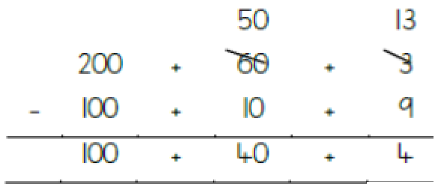
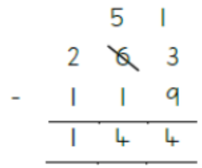
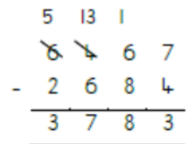
Stage 2	Please note: Concrete apparatus and pictorial representations should still be used to support children who may be struggling with abstract concepts. Concrete apparatus should be readily available for lower achieving children and these with SEND.	Children will begin to use the bar model when problem solving. Jottings and calculations should be recorded to show their processes. 	**Column method** Children to further develop their confidence using the column method. Larger numbers, decimal places and inserting zero for place holders when decimals are different.    Insert zeros for place holders. 

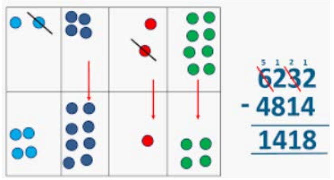
Calculation Policy

SUBTRACTION - KS1 (Years 1&2)			
	Concrete	Pictorial	Abstract
Stage 1	**Taking objects away** Use part whole model, cubes and bead strings to subtract two numbers together by moving objects away from the group.    	Use jottings to represent numbers. Children will learn to cross out drawn objects to show what has been taken away.  	Children will record their calculation using a pictorial method along with a calculation using numbers and symbols.  11 - 4 = 7 They may use their fingers to support their mental methods 

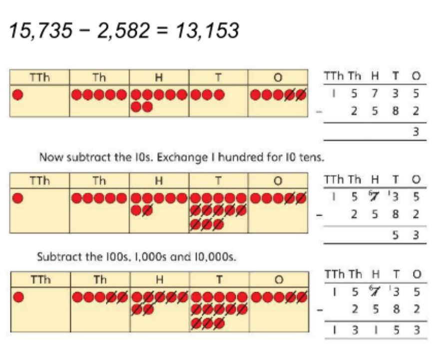
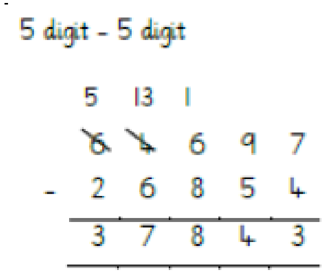
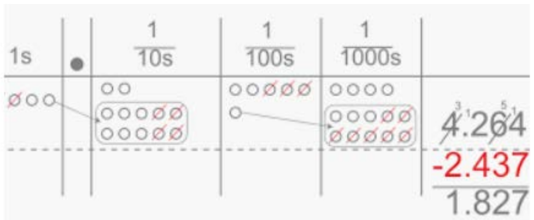
Stage 2	Children will use dienes cubes to subtract larger numbers where exchanging is not required. Children will lay out the first number using the dienes cubes and then move the second number away to show the subtraction.  They will also use a bead string to add larger numbers by counting in tens and ones. 	**Number line** Children will begin to draw their own number lines. Start at the larger number on the number line and count back in ones or in one jump to find the answer.  Numbers will get progressively larger throughout the keystage. Children will be able to subtract tens and ones using an empty number line. Children will show their representations from the concrete method using pictures.  43—21 = 22	Children will record their calculation using a pictorial method along with a calculation using numbers and symbols. 25 - 12 = 13 Children will begin to subtract multiples of tens. 25 - 10 25 - 10 = 15
Stage 3	Children will begin to use place value counters and dienes cubes to show how to exchange between units of number. They will be able to change 1 ten and exchange it for 10 ones. 	**Empty number line** -Use an empty number line to count back in tens and then ones.  When confident:  - 40 47 – 24 = 23 40 + 7 – 20 + 4 20 + 3	**Partitioning method** Children will begin to use the partitioning method. Tens and ones will be subtracted to form partial sums and then these partial sums will be added together to find the total. 47 – 23 = 24 47 – 20 = 27 27 – 3 = 24

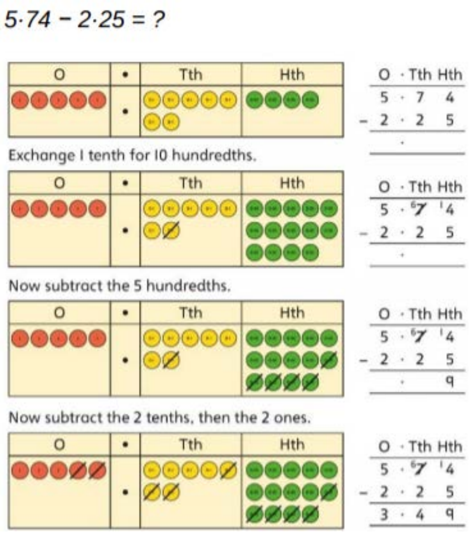
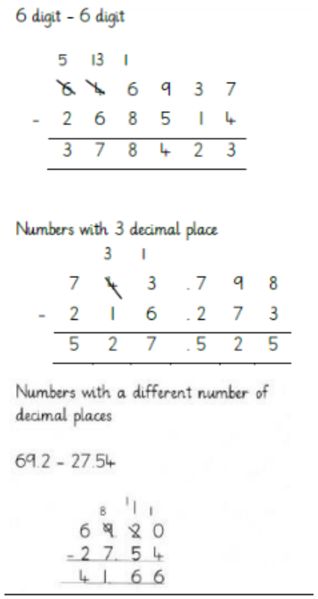
Calculation Policy

SUBTRACTION - Lower KS2 (Years 3 & 4)			
	Concrete	Pictorial	Abstract
Stage 1	Children consolidate and use place value counters and dienes cubes to show how to exchange between units of number. They will be able to change 1 ten and exchange it for 10 ones.  They will be able to begin to lay this out like the column method and removing counters or cubes away to represent taking away.   	Consolidate their learning from KS1 by using an empty number line to calculate larger numbers. Children will also be able to draw representations of dienes cubes and place value counters by crossing out the number being taken away.  	  Children to further secure their knowledge using the **partitioning method** but will start to lay their work out using the column method approach. Tens and ones will be subtracted to form partial sums and then these partial sums will be added together to find the total.
Stage 2	Children begin to set out HTU - HTU using dienes cubes and place value counters (that cross the tens boundary) in columns and record as column subtraction with decomposition. Teach children how to exchange units of numbers.  	Children may draw dienes cubes or place value counters and cross off showing their understanding of taking away. They will need to represent any exchanging that takes place.   	**Partitioning method - with exchanging** Children will use the partitioning method to show exchanging.  Once confident, children can start to use the column method. 
Stage	Children continue to develop their confidence in using dienes cubes and place value counters to show decomposition using the column method. 	Children draw representations from concrete activities	**Column Method** Children continue to use column method to subtract larger numbers. 

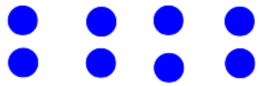
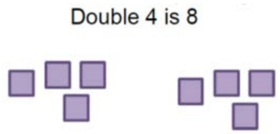
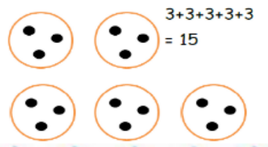
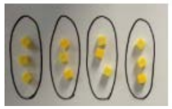
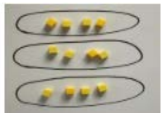
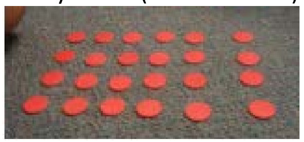
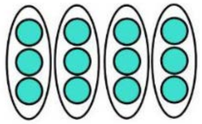
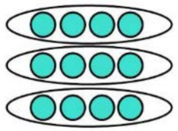
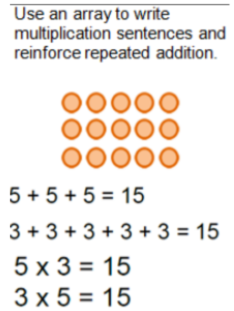
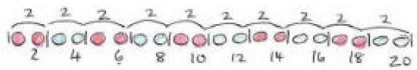
3		using dienes cubes and place value counters. 	

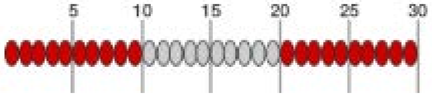
Calculation Policy

SUBTRACTION - Upper KS2 (Years 5 & 6)			
	Concrete	Pictorial	Abstract
Stage 1	Please note: Concrete apparatus and pictorial representations should still be used to support children who may be struggling with abstract concepts. Concrete apparatus should be readily available for lower achieving children and these with SEND.	Children can draw using place value counters showing how exchanging takes place between the units of numbers.  Children also show subtraction on an empty number line using larger numbers. 	**Column Method** Children will continue to develop their understanding of column method subtraction. Calculations will become larger. 
Stage 2	Introduce decimal place value counters and model	Children will draw their representations showing where they have exchanged. 	Children will continue to develop their understanding of column method subtraction. Calculations will become larger, include decimal places and require 0 to be added as

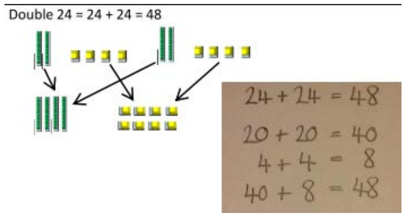
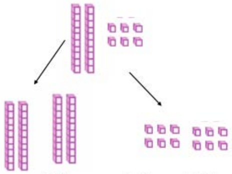
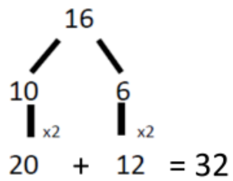
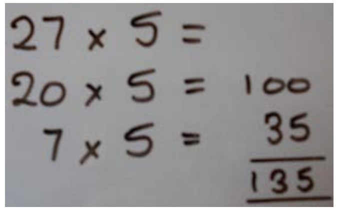
	exchange for subtracting between units of numbers.  		a placeholder with more than one exchange. 

Calculation Policy

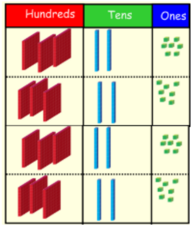
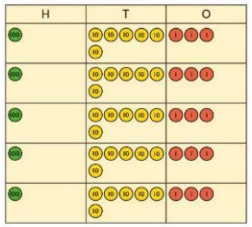
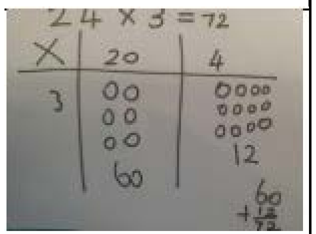
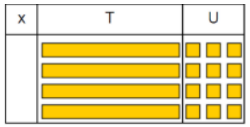
MULTIPLICATION - KS1 (Years 1&2)			
	Concrete	Pictorial	Abstract
Stage 1	**Repeated addition - Groups of multiple objects** Children will count groups of the same number of objects and add them together. The children learn about grouping in practical contexts and through pictorial representations. 	Children draw representations to show counting in multiples and groups.    	Children show multiplication as repeated addition. Children may provide pictorial representations to support. 3 x 9 3 + 3 + 3 = 9
Stage 2	**Arrays** Children will be able to represent a multiplication calculation using an array and write the multiplication symbol within a number sentence. Children will also understand that multiplication can be carried out in any order (commutative).    3 x 5 = 15  5 x 3 = 15	Children draw representations to show arrays.  	Children use arrays to show how to solve multiplication calculations. Children are able to show that multiplication can be done in any order (commutative). 3 x 5 = 15 5 x 3 = 15 Introduce x sign and record as number sentence 7 x 10 = 70 4 x 5 = 20 
Stage 3	**Number line** Children will understand the operation of multiplication as repeated addition on a blank number line and will use practical resources to support this. Count the groups as children are skip counting, children may use their fingers as they are skip counting.	Children will be able to use an empty number line to show multiplication as repeated addition. The use of beadstring concrete resources may be used to support conceptual understanding.   	Children show multiplication as repeated addition. 5 + 5 + 5 = 15 Introduce x sign and record as number sentence 7 x 10 = 70

<table>
<tr><td></td><td>
</td><td></td><td>4 x 5 = 20</td></tr>
</table>

Calculation Policy

<table>
<tr><td colspan="4">MULTIPLICATION - Lower KS2 (Years 3 & 4)</td></tr>
<tr><td></td><td>Concrete</td><td>Pictorial</td><td>Abstract</td></tr>
<tr><td>Stage 1</td><td>Partitioning
Children will learn to multiply ones and tens separately before recombing the numbers back together. They can use Dienes cube of place value counters to achieve this.
</td><td>Children can draw representations of the partitioning process to support their conceptual understanding.

40 + 12 = 52</td><td>Partition a number and then multiply each part before recombining it back together.
</td></tr>
<tr><td>Stage 2</td><td>Grid Method
Show the links with arrays to first introduce the grid method.

Move onto Dienes cubes to move towards a more compact method.

Move on to place value counters to show how we are finding groups of a number. We are multiplying by 5 so we need 5 rows of that number.
</td><td>Pictorial representations can be made using their concrete manipulatives as visuals. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown.
13 x 4 = (10 x 4) + (3 x 4)
= 40 + 12
= 52</td><td>Children should be able to draw the grid method for each multiplication. The grid method will be used to show how this relates to a formal written method.

Grid method<table><tr><td>X</td><td>30</td><td>6</td></tr><tr><td>4</td><td>120</td><td>24</td></tr></table>
Grid method may then lead to the expanded method.

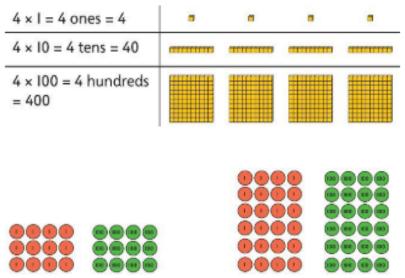
36
x 4
24 (6 x 4)
120 (30 x 4)
144</td></tr>
</table>

Stage 3

Concrete materials may be needed to support children's conceptual understanding. Dienes cubes and place value counters will support.

When multiplying by 10,100,1000 initial concrete resources will be used to support understanding.

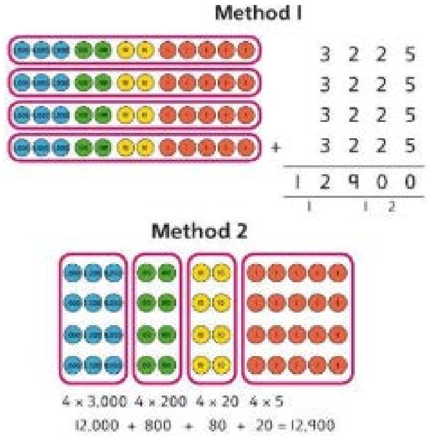
Use place value equipment to multiply by 10, 100 and 1,000 by unitising.



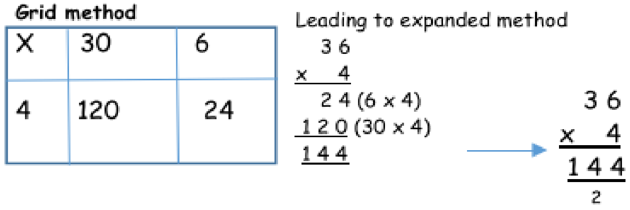
4 × 3 = 12
4 × 300 = 1,200

6 × 4 = 24
6 × 400 = 2,400

Use place value equipment to compare methods.



The **grid method** may be used to show how this relates to a formal written method.
Grid method will lead onto **expanded method** and then onto the **compact short multiplication.**



Use known facts and unitising to multiply.

5 × 4 = 20

5 × 40 = 200

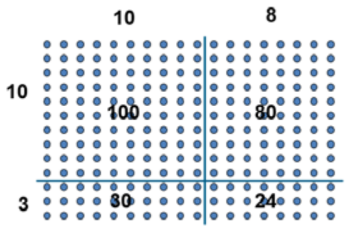
5 × 400 = 2,000

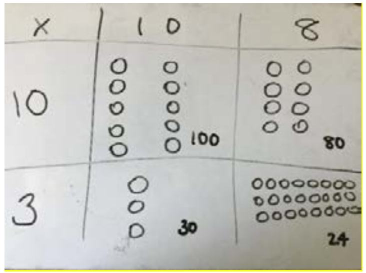
5 × 4,000 – 20,000

5,000 × 4 = 20,000

In line with the WR scheme to lead onto the expanded method from the grid method.

Show the link with arrays to first introduce the expanded method.





Start with long multiplication, reminding the children about lining up their numbers clearly in columns.

```
   18
x  13
   24  (3 x 8)
   30  (3 x 10))
   80  (10 x 8)
  100  (10 x 10)
  234
```

Calculation Policy

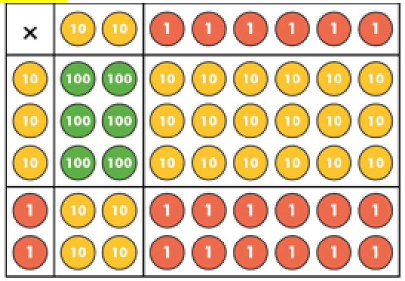
MULTIPLICATION - Upper KS2 (Years 5 & 6)

	Concrete	Pictorial	Abstract

Stage 1

Concrete

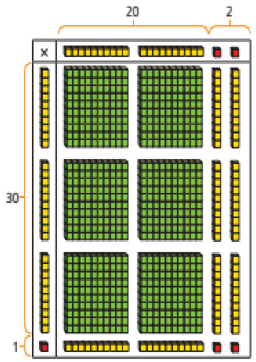
The area model reinforces their knowledge of the grid method



26 × 32 = $\boxed{}$

.

Pictorial



Abstract

Children use this model to be able to multiply two digit by two digit numbers.

28 × 14 = $\boxed{}$

×	20	8
10		
4		

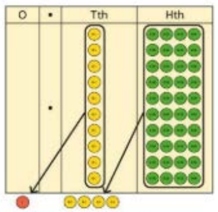
27 × 16 = $\boxed{}$

×		

Stage 2

Concrete

When multiplying decimals by 10,100,1000 initial concrete resources will be used to support understanding to show how exchanging can take place.



0·14 × 10 = 1·4

Pictorial

This pictorial grid method will support children's understanding of multiplying by 10, 100, 1000.

	Th	H	T	O	•	Tth
				2	•	5
2·5 × 10 = 25			2	5	•	
2·5 × 100 = 250		2	5	0	•	
2·5 × 1,000 = 2,500	2	5	0	0	•	

Abstract

Long multiplication

Children may wish to use 2 separate calculations to support their understanding. Reinforce language of place value when multiplying by multiples of 10. Extend to 3 or 4-digit numbers multiplied by a 2-digit number.

```
  2 3
X 1 3
+ 6 9   (3 x 23)
2 3 0   (10 x 23)
2 9 9
```

Stage 3

Concrete

Please note: Concrete apparatus and pictorial representations should still be used to support children who may be struggling with abstract concepts. Concrete apparatus should be readily available for lower achieving children and these with SEND.

Pictorial

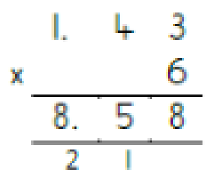
Please note: Concrete apparatus and pictorial representations should still be used to support children who may be struggling with abstract concepts. Concrete apparatus should be readily available for lower achieving children and these with SEND.

Abstract

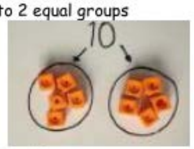
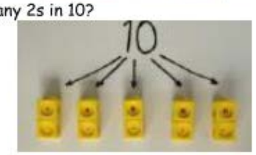
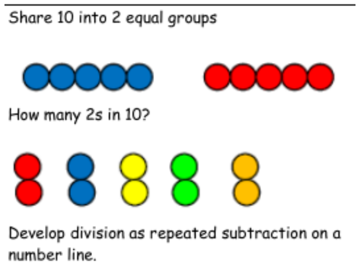
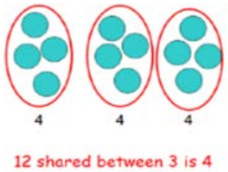
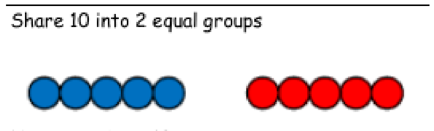
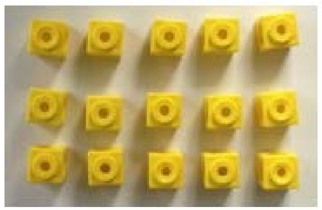
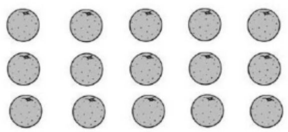
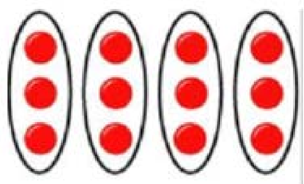
Use column multiplication, ensuring understanding of place value at each stage.

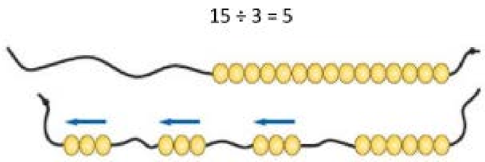
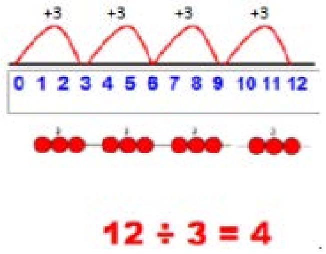
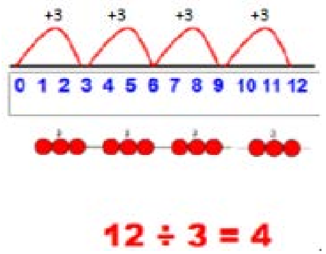
```
      1  2  7  4
  ×         3  2
     2  5 ₁4  8     1,274 × 2
  3  8 ₂2 ₁2  0     1,274 × 30
  4  0  7  6  8     1,274 × 32
  ₁
```

1,274 × 32 = 40,768

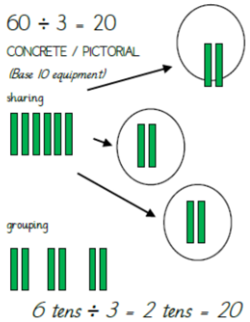
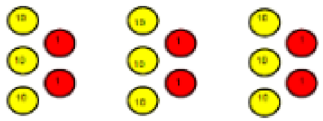
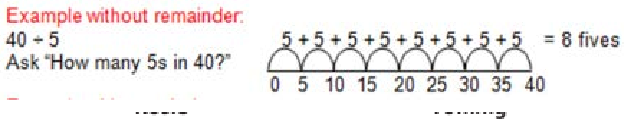
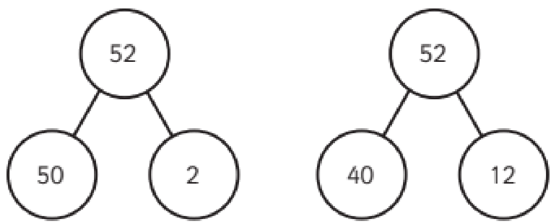
			

Calculation Policy

DIVISION - KS1 (Years 1&2)			
	Concrete	Pictorial	Abstract
Stage 1	**Sharing and Grouping** Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding. Share 10 into 2 equal groups  How many 2s in 10? 	Use pictures to share objects. Use circles rather than dots to aid counting.   	Children will be able to represent a division calculation using a pictorial method and write the division within a number sentence. $10 \div 2 = 5$ 
Stage 2	**Arrays** Link division to multiplication by creating an array and thinking about the number sentences that can be created.  Eg: $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$	Draw arrays to show how pictures are divided. 	Children will be able to represent a division calculation using an array and write the division within a number sentence $12 \div 3 = 4$ 
S	**Repeated addition and subtraction**	Children will understand the operation of division as	Children will be able to represent a division calculation

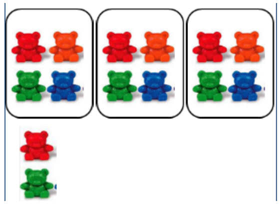
Stage 3	Children will understand the operation and repeated addition or subtraction using bead strings and number lines. This will support the pictorial element. 	grouping using repeated addition or subtraction on a prepared number line. 	using a numberline and write the division within a number sentence. 

Calculation Policy

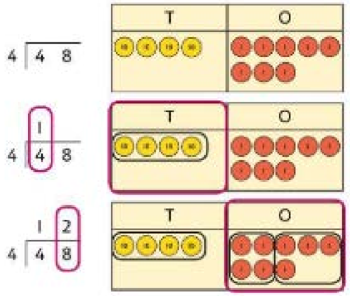
DIVISION - Lower KS2 (Years 3 & 4)			
	Concrete	Pictorial	Abstract
Stage 1	**Division with no remainders through sharing**. Use concrete materials to share into groups.  96 ÷ 3 = 32 	Consolidate learning from KS1 using diagrams of sharing and repeated subtraction and addition on a number line to make jumps   Concrete methods could be represented pictorially within books to show understanding.	How many groups of 6 in 24? $24 \div 6 = 4$ Abstract methods may be supported with pictorial methods within the children's books.

Stage 2

Division with remainder through sharing
14 ÷ 3 =
Divide objects between groups and see how much is left over.

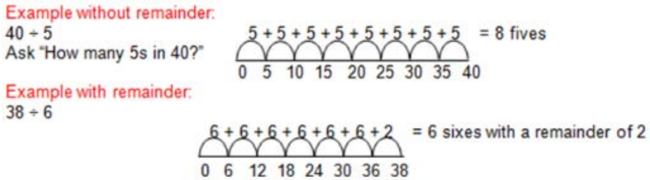


Division no remainders - introduction to bus stop method
Use place value equipment on a place value grid alongside short division.
The model uses grouping.



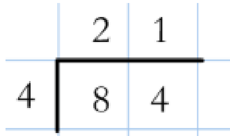
Students can continue to use drawn diagrams with circles to help them divide numbers into equal groups.
Remainders will be seen by not fitting into a whole group.

Draw dots and group them to divide an amount and clearly show a remainder.



Children will begin to move onto division with remainders. A number sentence will support any abstract written calculation by using pictorial method to support.

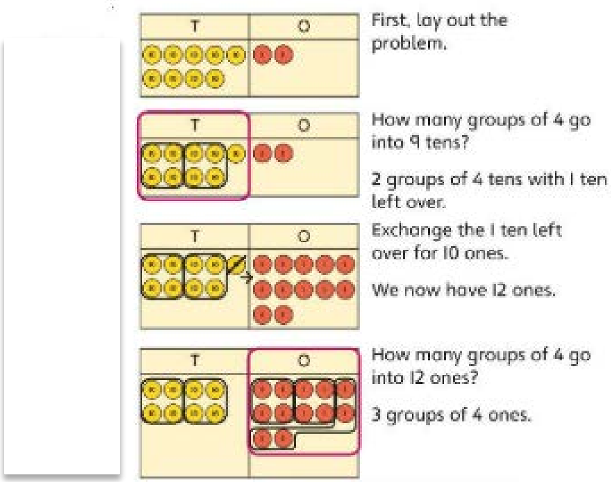
Short division
Children will begin to use the formal written method of division without remainders. This will only come after a clear concept is understood using manipulatives.



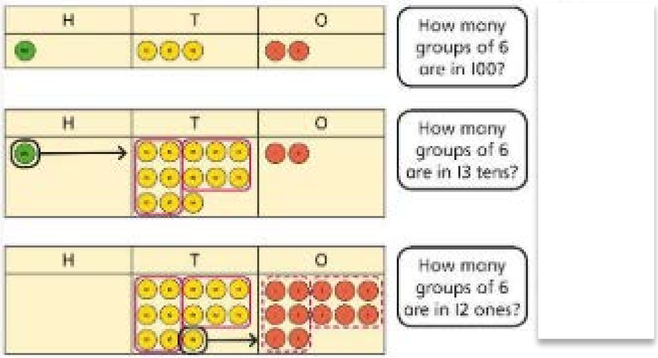
Dividing by 2,3,4, and 5

Stage 3

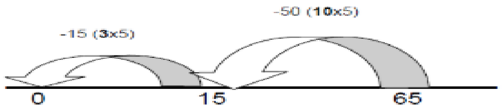
Division with remainders

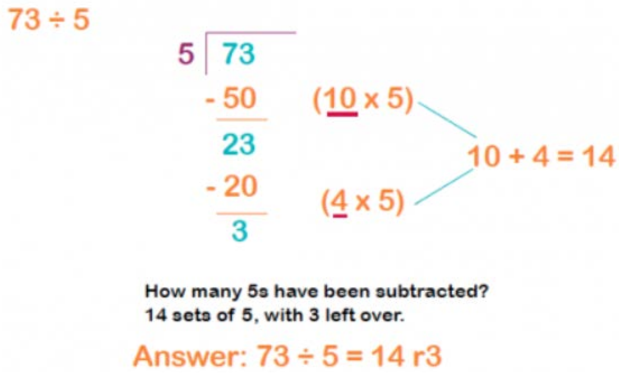


Pictorial representations can be used to support any concrete manipulatives.



Continue to use blank number lines as appropriate, using multiples of the divisor.
65 ÷ 5 = 13

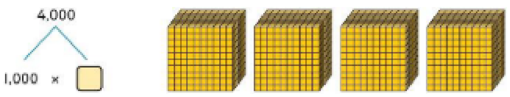
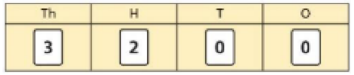
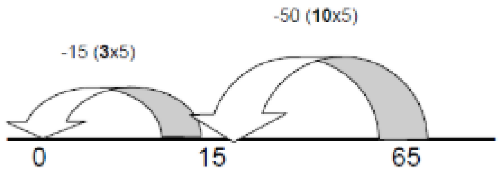
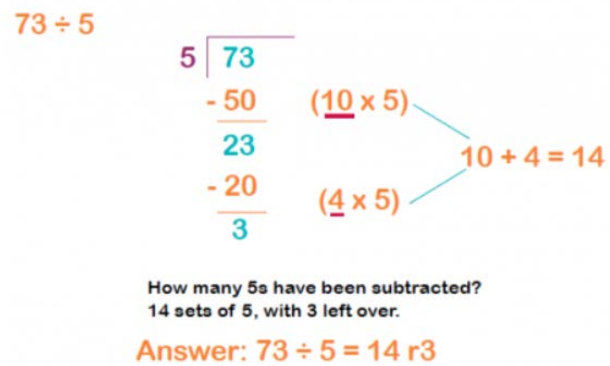
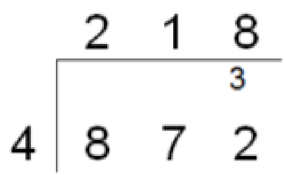
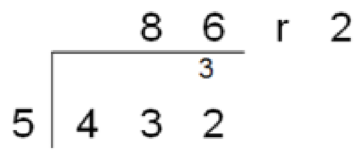




Reinforcing the part/whole model to support division of larger numbers

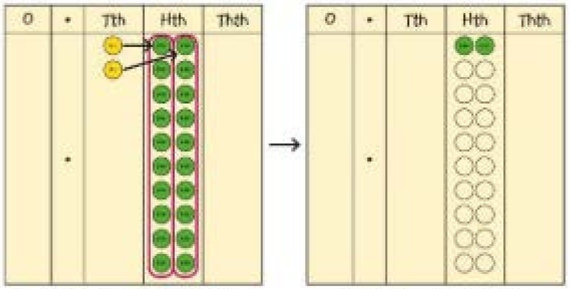
Calculation Policy

DIVISION - Upper KS2 (Years 5 & 6)

Stage	Concrete	Pictorial	Abstract
Stage 1	**Dividing whole numbers by 10, 100 and 1,000** Use place value equipment to support unitising for division. *4,000 ÷ 1,000*  *4,000 is 4 thousands.* *4 × 1,000= 4,000* *So, 4,000 ÷ 1,000 = 4* Concrete and pictorial representations may still be required to support the formal method of division (Bus Stop) - Go back to LKS2 to consolidate learning.	Understand how and why the digits change on a place value grid when dividing by 10, 100 or 1,000.  *3,200 ÷ 100 = ?* *3,200 is 3 thousands and 2 hundreds.* *200 ÷ 100 = 2* *3,000 ÷ 100 = 30* *3,200 ÷ 100 = 32* *So, the digits will move two places to the right.* Continue to use blank number lines as appropriate, using multiples of the divisor. 65 ÷ 5 = 13  	**Chunking** Chunking is repeated subtraction of the divisor and multiples of the divisor.  **Bus Stop Method for division** Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder. 

Stage 2

Dividing decimals by 10, 100 and 1,000
Use place value counters to represent dividing by 10, 100, 1000. Represent division using exchange on a place value grid.



Exchange each 0·1 for ten 0·01s. Divide 20 counters by 10.

0·2 is 2 tenths.
2 tenths is equivalent to 20 hundredths.
20 hundredths divided by 10 is 2 hundredths.

Represent division to show the relationship with multiplication. Understand the effect of dividing by 10, 100 and 1,000 on the digits on a place value grid.

O	•	Tth	Hth	Thth
0	•	8	5	
0	•	0	8	5

$0{\cdot}85 \div 10 = 0{\cdot}085$

O	•	Tth	Hth	Thth
8	•	5		
0	•	0	8	5

$8{\cdot}5 \div 100 = 0{\cdot}085$

Finally move into decimal places to divide the total accurately using a formal method for division (Bus stop)

```
          1   4  .  6
      ----------------
            16      21
3  5 | 5  1   1  .  0
```

Stage 3

Long Division - Abstract Method
Calculations will start with tens and ones and move onto more advanced division calculations.

1. Divide.	2. Multiply & subtract.	3. Drop down the next digit.
t o 2 2) 5 8	t o 2 2) 5 8 - 4 1	t o 2 9 2) 5 8 - 4 ↓ 1 8
Two goes into 5 two times, or 5 tens ÷ 2 = 2 whole tens -- but there is a remainder!	To find it, multiply 2 × 2 = 4, write that 4 under the five, and subtract to find the remainder of 1 ten.	Next, drop down the 8 of the ones next to the leftover 1 ten. You combine the remainder ten with 8 ones, and get 18.