Castle Newnham School

TRADITIONAL VALUES, BRIGHT FUTURES, ONE JOURNEY

Primary Calculation Policy

Governors' Committee:	Curriculum Delivery & Design Board
Adopted by the Governing Body on:	28 February 2023
Signed: (Chair of Committee)	
Signed: (Headteacher)	
Proposed date of review:	March 2025

A. RATIONALE

This calculation policy is designed to support the children's learning by equipping them with appropriate mental and written calculation strategies.

The emphasis of this policy is to ensure the children are able to use concrete methods, before moving onto the pictorial and abstract. Although the guidance outlines the year group expectations, it is important to remember that the children's mathematical skills develop at different rates. Using this guidance, all children will use a combination of practical, mental and written activities throughout all year groups. This approach is also emphasised through our development of the Teaching for Mastery approach in Primary which aims to teach all children to become masters of maths through developing their understanding, increasing their fluency and ability to tackle reasoning and problem solving questions.

B. AIM

National Curriculum Aims

The National Curriculum for mathematics aims to ensure that all pupils:

- 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.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- 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.

This Policy is designed to equip children with the skills they need to achieve the National Curriculum aims.

C. PRINCIPLES

How to use the policy:

· Use the policy as the basis of your planning but ensure there is personalised learning
· Always use Assessment for Learning to identify suitable next steps in calculation for groups of children and scaffold as appropriate.
· If, at any time, children are making significant errors, return to the previous stage in calculation · Always use 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

D. PROCESSES – PRIMARY

National Curriculum Aims

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- 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.

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Mathematical language

The 2014 National Curriculum is explicit in articulating the importance of pupils using the correct mathematical language as a central part of their learning. The non-statutory guidance highlights the requirement for pupils to extend their language around certain concepts. It is therefore essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate mathematical vocabulary. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, apparatus, pictures or diagrams) and explained carefully. High expectations of the mathematical language used are essential, with teachers only accepting what is correct.

For example:

✓	**x**
ones	units
Is equal to	Equals/the answer is
Zero	O (said oh)
Exchanging	Borrowing

Using correct mathematical language is crucial for thinking, learning and communicating mathematically. We need to encourage children to explain what they are doing and why they are doing it. We must offer them opportunities to use mathematical language frequently, for example by participating in paired activities, group discussions and games as well as other dialogues. The productive use of spoken language in mathematics allows children to evaluate their learning, support others' suggestions, challenge ideas, develop an argument or prove their answer, reason or justify and ask questions. Therefore, it is important to encourage children not just to learn and remember the correct vocabulary, but also to use these words regularly to communicate mathematically. This will play a vital role in enabling children to develop their mathematical thinking. Using mathematical vocabulary can help all children to make links across areas of mathematics, across the curriculum as a whole and also within real-life situations. Teachers need to plan the introduction of new words into lessons and provide opportunities for children to rehearse and use them on a regular basis so that they begin to remember both the words themselves and their meanings. It is also essential that other adults working with children use mathematical vocabulary accurately and consistently.

Calculation Policy Progression and Guidance throughout the year groups

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6

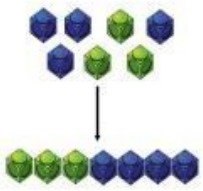
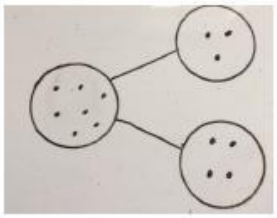
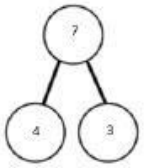
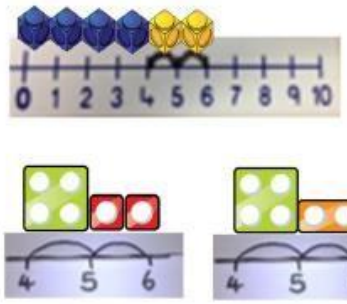
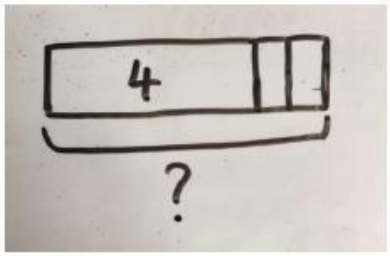
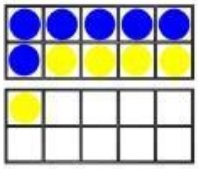
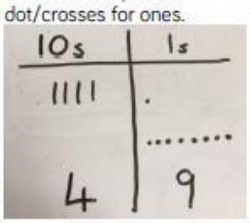
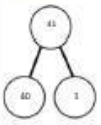
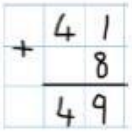
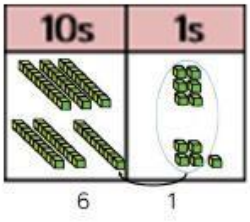
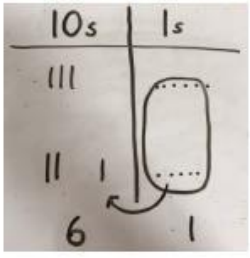
Addition	Understanding of what "more" means and be able to say what is one more than a given number. Constructing number sentences verbally, making marks or using pictures to go with practical activities. Combining groups of objects or pictures using concrete apparatus. Starting at the bigger number and counting on- using practical resources.	Combining two parts to make a whole. Part whole model. Starting at the bigger number and counting on- using practical resources. Regrouping to make 10 using a tens frame.	Adding three single digits. Use of base 10 to combine 2 numbers. Adding using partitioning. Adding on a blank number line.	Column method- regrouping. Using place value counters (up to 3 digits).	Column method- regrouping /exchanging (up to 4 digits)	Column method- regrouping. Use of place value counters for adding decimals.	Column method- regrouping Abstract methods. Place value counters to be used for adding decimal numbers

Subtraction	Understanding of what "less" means and be able to say what is one less than a given number. Constructing number sentences verbally, making marks or using pictures to go with practical activities. Concrete apparatus is used to relate subtraction to taking away and counting how many objects are left. Counting back.	Taking away ones. Counting back. Find the difference. Part whole model. Make 10 using the ten frame.	Counting back. Find the difference. Part whole model. Make 10. Use of base 10. Subtracting on a blank number line.	Column method with regrouping. (up to three digits using place value counters)	Column method with regrouping. (up to 4 digits)	Column method with regrouping. Abstract for whole numbers. Start with place value counters for decimals- with the same amount of decimal places.	Column method with regrouping. Abstract methods. Place value counters for decimal- with different amounts of decimals places.

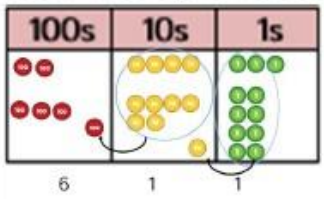
Multiplication	Recognising and making equal groups. Doubling. Counting in multiples using cubes, Numicon and other objects. Counting in twos, fives and tens both aloud and with objects.	Recognising and making equal groups. Doubling. Counting in multiples using cubes, Numicon and other objects.	Arrays- showing commutative multiplication.	Arrays 2 digit x 1 digit using base 10. Introduce column multiplication.	Column multiplication- introduced with place value counters. (2 and 3 digit numbers multiplied by 1 digit.)	Column multiplication. Abstract but might need a repeat of Year 4first (up to 4 digit numbers multiplied by one or two digits).	Column multiplication. Abstract methods (multi digit up to 4 digits by a 2 digit number.)
Division	Sharing objects into groups. Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?	Sharing objects into groups. Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups? Use cubes and draw round 3 cubes at a time.	Division as grouping. Division within arrays- linking to multiplication. Repeated subtraction.	Division with a remainder- using lollipop sticks, times tables facts and repeated subtraction. 2 digits divided by 1 digit using base 10 or place value counters. Introduce short division.	Division with a remainder. Short division (up to 3 digits by 1 digit- concrete and pictorial).	Short division. (Up to 4 digits by a 1 digit number including remainders.)	Short division. Long division with place value counters (up to 4 digits by a 2 digit number). Children should exchange into the tenths and hundredths column too.

Calculation Policy: Addition

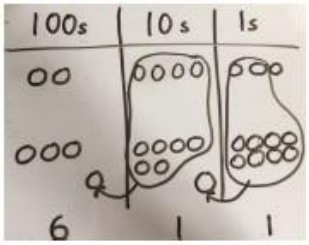
Key Language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars). 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 
Counting on using number lines using cubes or Numicon. 	A bar model which encourages the children to count on, rather than count all. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 
Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$
TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8  1 + 8 = 9 40 + 9 = 49 
TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Chidlren to represent the base 10 in a place value chart. 	Looking for ways to make 10. 36 + 25= 1 5 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 36 Formal method: +25 61 1

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.

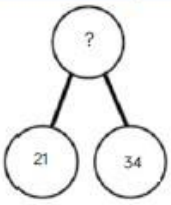


Chidren to represent the counters in a place value chart, circling when they make an exchange.



$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 1\ 1 \end{array}$$

Conceptual variation; different ways to ask children to solve 21 + 34



?	
21	34

Word problems:
In year 3, there are 21 children and in year 4, there are 34 children.
How many children in total?

21 + 34 = 55. Prove it

$$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$$

21 + 34 =

$\square$ = 21 + 34

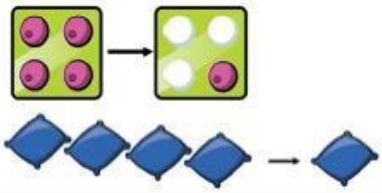
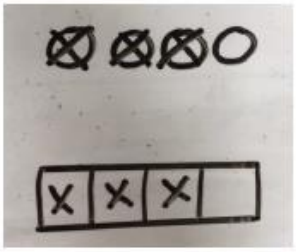
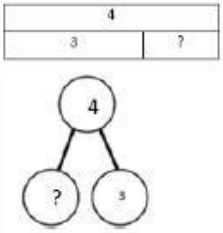
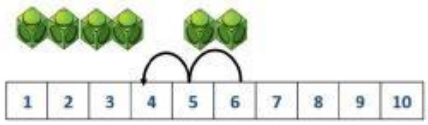
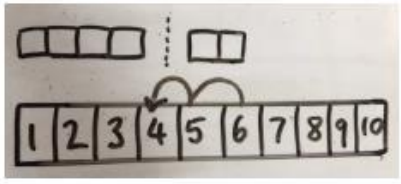
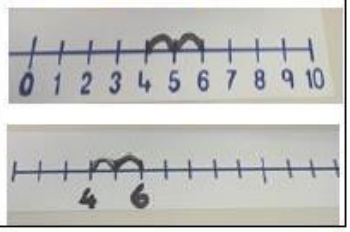
Calculate the sum of twenty-one and thirty-four.

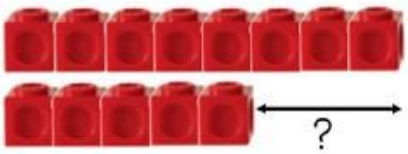
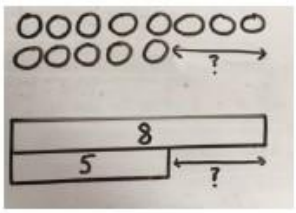
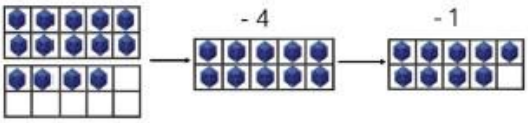
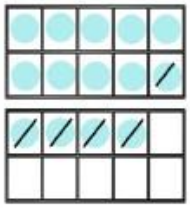
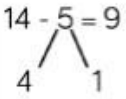
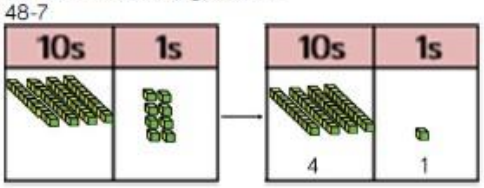
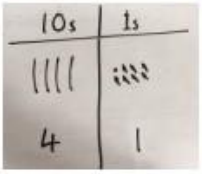
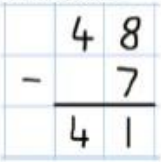
Missing digit problems:

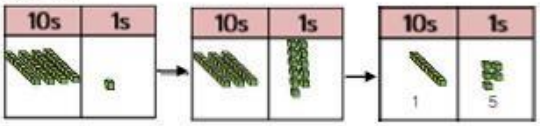
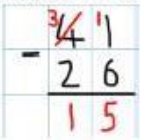
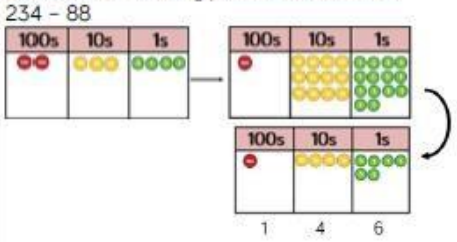
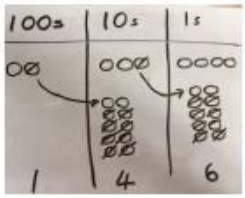
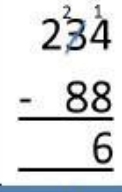
10s	1s
1	
	?
?	5

Subtraction

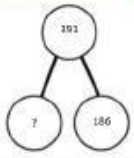
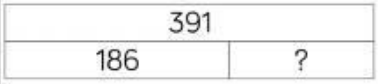
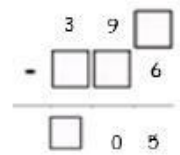
Key language: take away, less than, the difference, subtract, minus, fewer, decrease

Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 - 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4- 3 = $\square$ = 4 - 3 
Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 - 2 = 4 	Children to represent what they see pictorially e.g. 	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line 

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5. 	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate. 	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference.
Making 10 using ten frames. 14 – 5 	Children to present the ten frame pictorially and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9
Column method using base 10. 48-7 	Children to represent the base 10 pictorially. 	Column method or children could count back 7. 

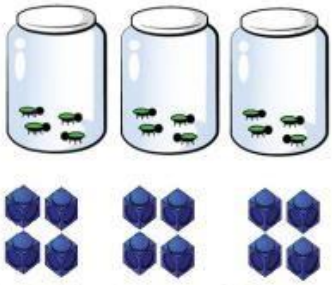
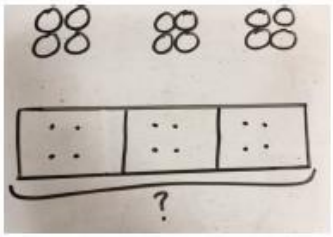
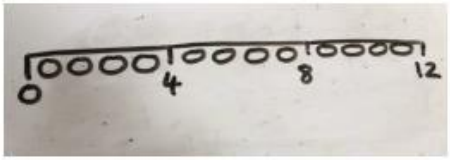
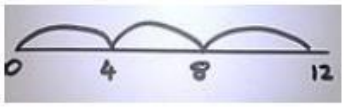
Column method using base 10 and having to exchange. 41 – 26 	Represent the base 10 pictorially, remembering to show the exchange. 	Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11. 
Column method using place value counters. 234 – 88 	Represent the place value counters pictorially; remembering to show what has been exchanged. 	Formal colum method. Children must understand what has happened when they have crossed out digits. 

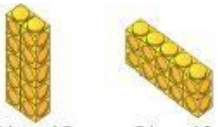
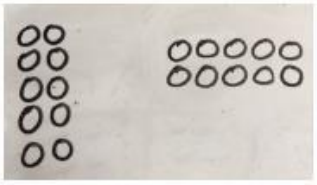
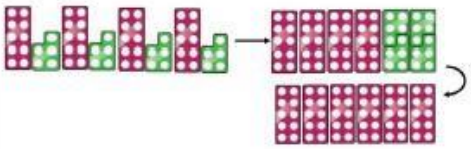
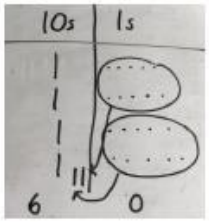
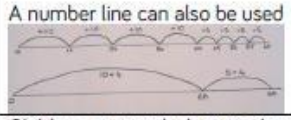
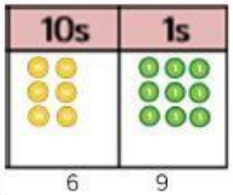
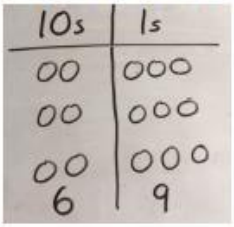
Conceptual variation; different ways to ask children to solve 391 - 186

 	Raj spent £391, Timmy spent £186. How much more did Raj spend? Calculate the difference between 391 and 186.	☐ = 391 – 186 391 -186 ___ What is 186 less than 391?	Missing digit calculations 

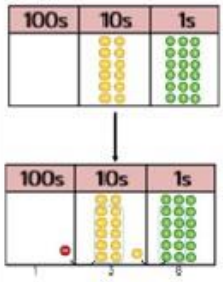
Multiplication

Key Language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

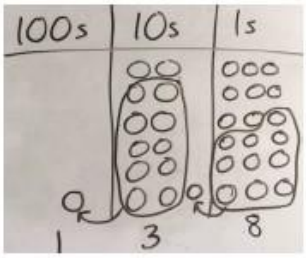
Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
Number lines to show repeated groups- 3 × 4  Cuisenaire rods can be used too.	Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jumps of four. 3 × 4 = 12 

Use arrays to illustrate commutativity counters and other objects can also be used. 2 × 5 = 5 × 2  2 lots of 5 5 lots of 2	Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. 10 = 2 × 5 5 × 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5
Partition to multiply using Numicon, base 10 or Cuisenaire rods. 4 × 15 	Children to represent the concrete manipulatives pictorially. 	Children to be encouraged to show the steps they have taken. 4 × 15 10 5 10 × 4 = 40 5 × 4 = 20 40 + 20 = 60 A number line can also be used 
Formal column method with place value counters (base 10 can also be used.) 3 × 23 	Children to represent the counters pictorially. 	Children to record what it is they are doing to show understanding. 3 × 23 3 × 20 = 60 3 × 3 = 9 20 3 60 + 9 = 69 23 × 3 69

Formal column method with place value counters.
6 x 23



Children to represent the counters/base 10, pictorially e.g. the image below.



Formal written method

$$6 \times 23 = 138$$

$$\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \hline 1\ 1 \end{array}$$

When children start to multiply 3d × 3d and 4d × 2d etc., they should be confident with the abstract:

To get 744 children have solved 6 × 124.
To get 2480 they have solved 20 × 124.

$$\begin{array}{r} 1\ 2\ 4 \\ \times\ \ 2\ 6 \\ \hline 7\ 4\ 4 \\ 2\ 4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ \hline 1\ 1 \end{array}$$

Answer: 3224

Conceptual variation; different ways to ask children to solve 6 × 23

Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?

With the counters, prove that 6 x 23 = 138

Find the product of 6 and 23

6 × 23 =

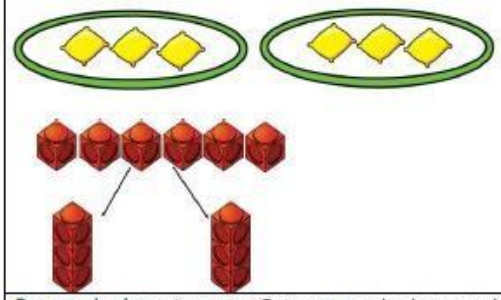
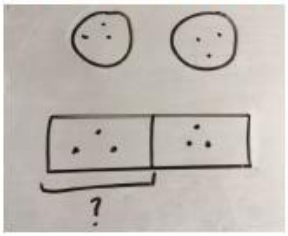
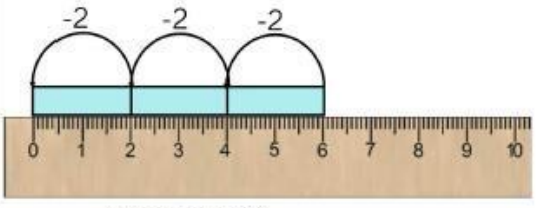
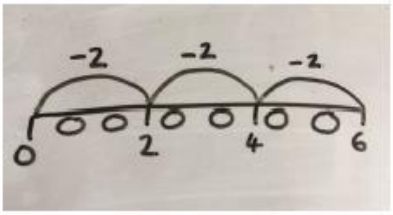
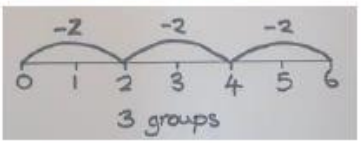
□ = 6 × 23

$$\begin{array}{rr} 6 & 23 \\ \times\ 23 & \times\ 6 \\ \hline & \end{array}$$

What is the calculation?
What is the product?

Division

Key language: share, group, divide, divided by, half.

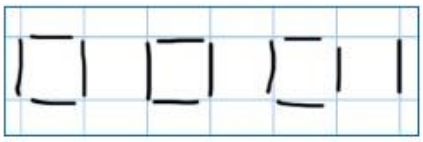
Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3 3 | 3 Children should also be encouraged to use their 2 times tables facts.
Repeated subtraction using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Children to represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted. 

2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used.
13 ÷ 4

Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.

There are 3 whole squares, with 1 left over.

Children to represent the lollipop sticks pictorially.

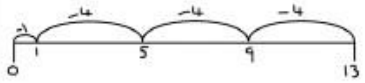


There are 3 whole squares, with 1 left over.

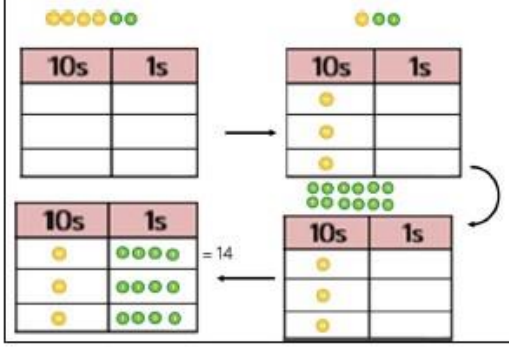
13 ÷ 4 = 3 remainder 1

Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

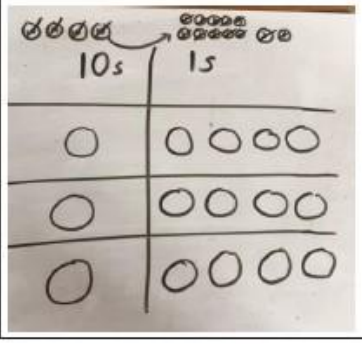
'3 groups of 4, with 1 left over'



Sharing using place value counters.
42 ÷ 3 = 14



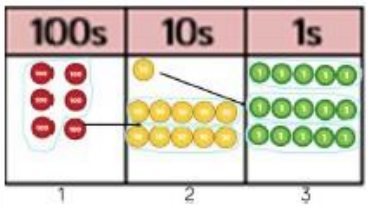
Children to represent the place value counters pictorially.



Children to be able to make sense of the place value counters and write calculations to show the process.

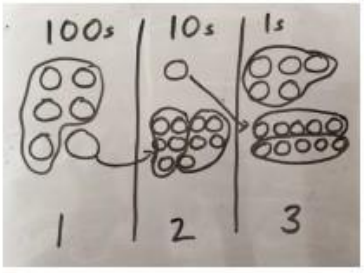
42 ÷ 3
42 = 30 + 12
30 ÷ 3 = 10
12 ÷ 3 = 4
10 + 4 = 14

Short division using place value counters to group.
615 ÷ 5



1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

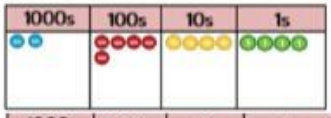
Represent the place value counters pictorially.



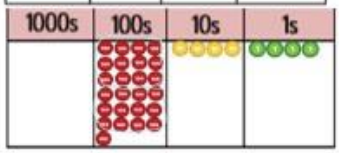
Children to the calculation using the short division scaffold.

$$5\overline{)615}^{\,123}$$

Long division using place value counters
2544 ÷ 12

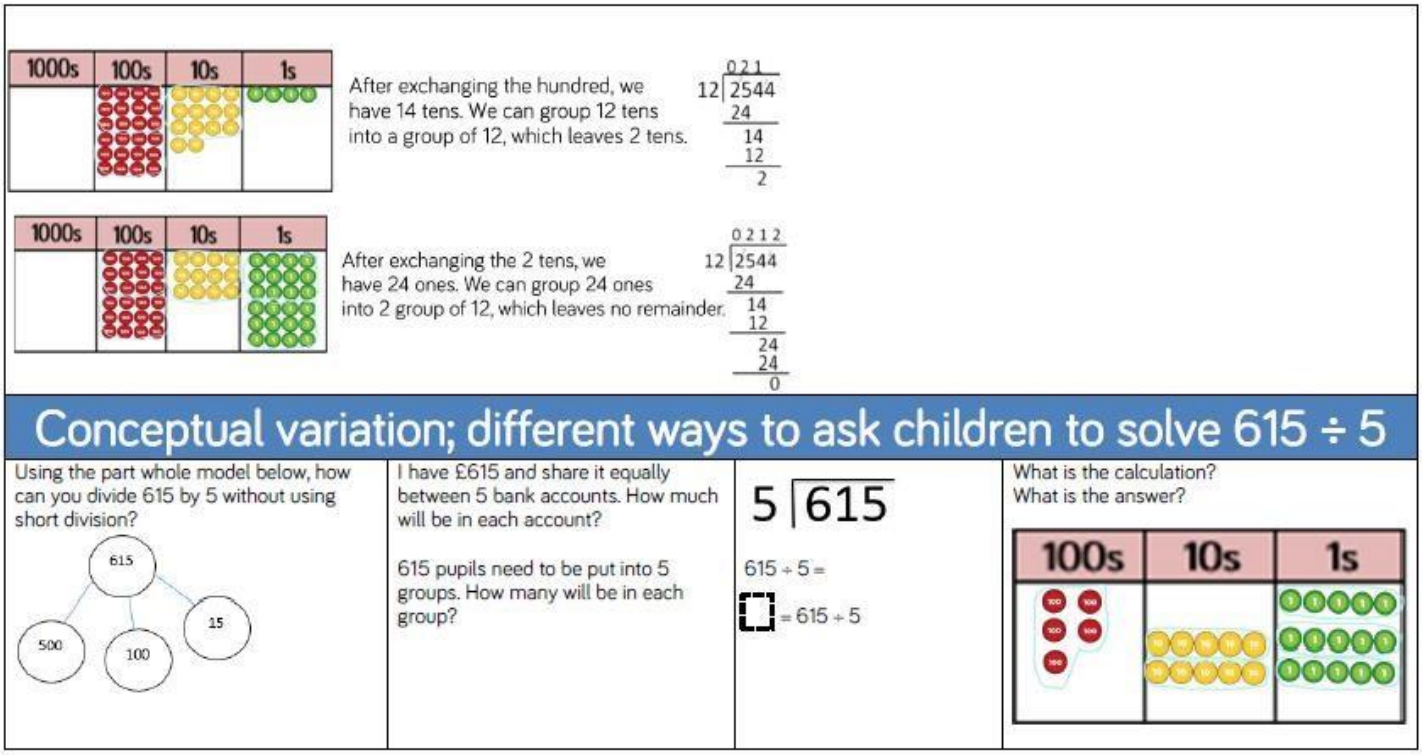


We can't group 2 thousands into groups of 12 so will exchange them.



We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$12\overline{)2544}^{\,212}$$
$$\underline{24}$$
$$14$$
$$\underline{12}$$
$$2$$



E. MONITORING, ASSESSMENT & EVALUATION

Monitoring, assessment and evaluation is an important process in ensuring that there is high quality teaching and learning at Castle Newnham School. The senior leadership team and the Maths subject lead will monitor the quality of teaching and learning. Monitoring includes: Scrutiny of plans and work, moderation of work, lesson observations, evaluation of data, talking to children, staff and parents.

Each child's progress is continually assessed and informs the teachers planning and teaching.

Throughout the Maths lesson, teachers assess the learning by:

- Using questioning
- Making observations
- Using both formal and informal assessment tasks
- Marking in line with the school policy
- Termly assessments
- Ongoing curriculum objective assessments

At the end of Year 2 and 6 the children sit standard assessment tasks (SATs). These are marked internally in Year 2 and externally in Year 6. The children will be assessed on their times tables knowledge in Year 4 through the Multiplication Check which is assessed externally.

The calculation policy will be continually reviewed by the Maths subject lead and SLT in line with the monitoring process.