'BE THE BEST YOU CAN BE!'

MATHEMATICS CALCULATION POLICY

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Contents

Calculation Policy Introduction

Introduction to the policy

This policy outlines how we teach maths at Roe Green Junior School. At the centre of our maths teaching is the belief that all children have the potential to understand mathematical concepts and succeed. Our aim is to give all children a strong foundation of maths skills, upon which they can build through secondary school and beyond. This is achieved through clear understanding of concepts and a determination to excel.

They should have access to the same curriculum and deepen their conceptual understanding by tackling challenging and varied problems. With calculation strategies children must be able to demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the calculation strategies that should be taught and used across the school, in line with the requirements of the 2014 Primary National Curriculum.

Mathematical Language

The 2014 National Curriculum is explicit in the need for children to use the correct mathematical language as a central part of their learning. The non-statutory guidance highlights the requirement for children 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 and precise mathematical vocabulary. High expectations of mathematical vocabulary is essential.

Concrete – Pictorial – Abstract

This policy has been designed to teach children through the use of concrete, pictorial and abstract methods. This calculation policy should be used to support children to develop a deep understanding of number and calculation.

Children develop an understanding of a mathematical concept through the three steps of: concrete, pictorial and abstract approach. Reinforcement is achieved by going back and forth between these representations.

Concrete Representation

This is the first step in a child's learning. The child is introduced to an idea or skill by acting it out with real objects. This is a "hands on" component using real objects and it is the foundation for conceptual understanding.

Pictorial Representation

Once the child has sufficiently understood that "hands on" experience, they can progress to relating them to pictorial representations, such as diagrams or pictures of a problem.

Abstract Representation

This is the third step in a child's learning. The child should now be capable of representing problems by using mathematical notation, for example: $12 \div 2 = 6$.

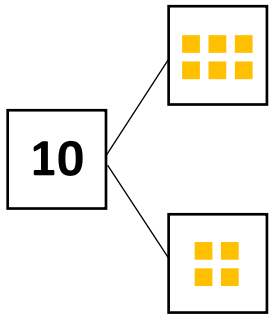
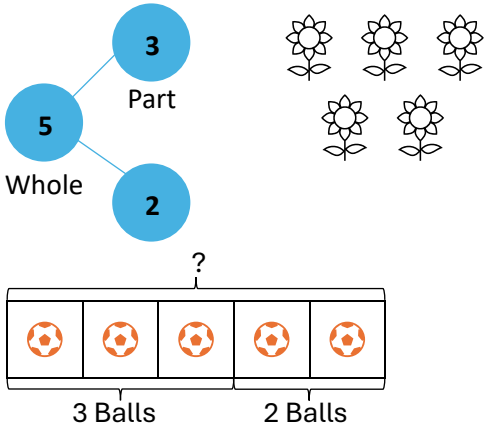
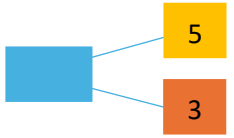
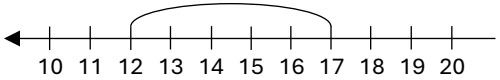
The importance of understanding place value

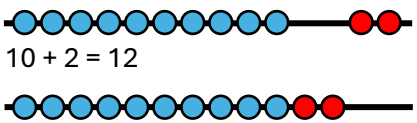
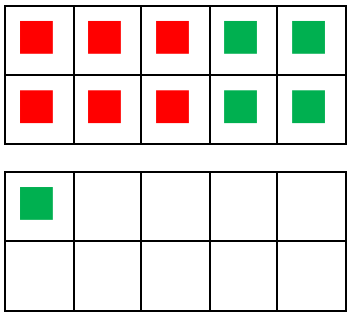
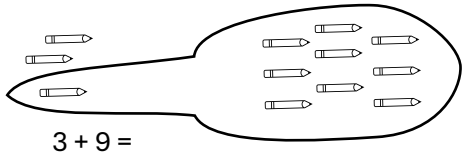
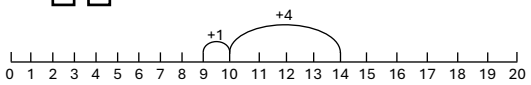
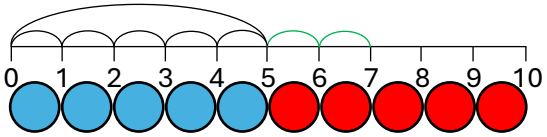
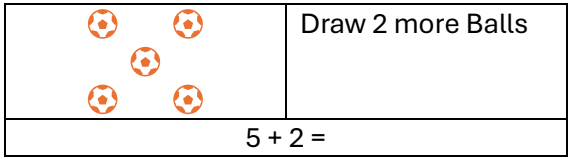
All children across the school will constantly refer to their understanding of place value. This includes the value of digits and the movement of digits when multiplying and dividing by multiples of 10.

10 TH	TH	H	T	O	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

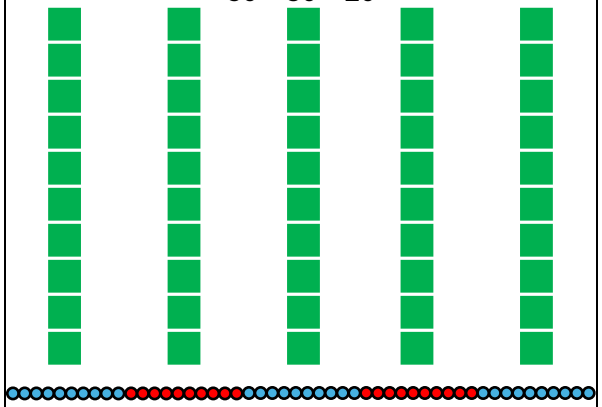
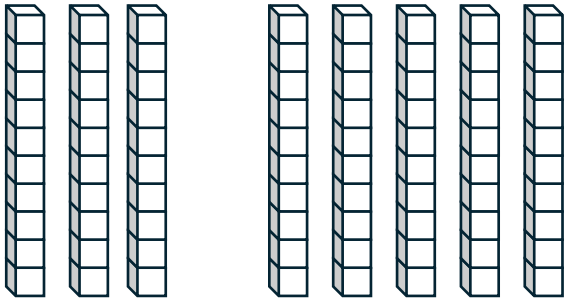
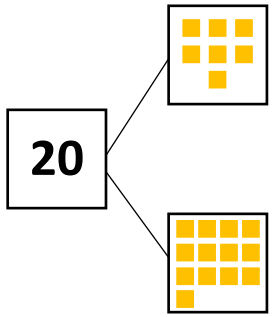
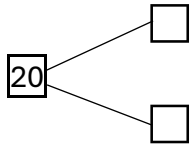
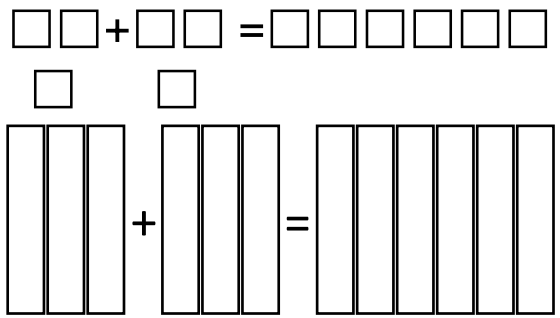
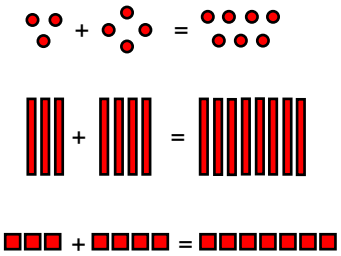
These grids will be used in maths lessons and must be displayed on maths walls. Children will be taught to first understand digit values and move on to sketch these charts whenever needed in their work

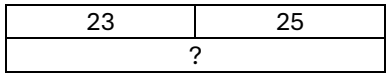
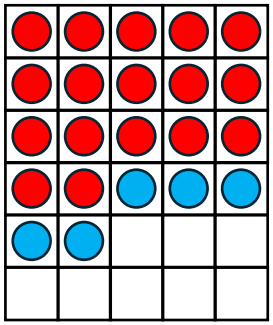
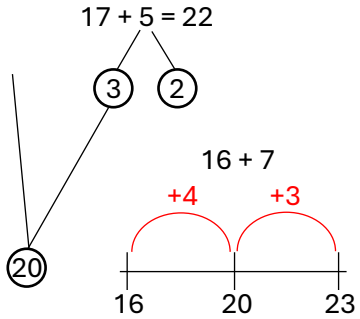
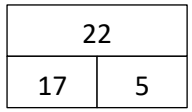
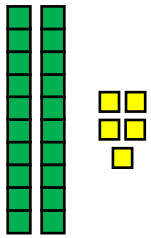
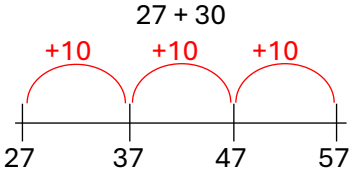
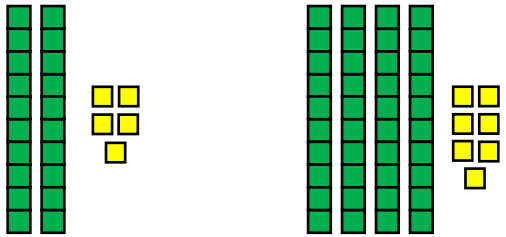
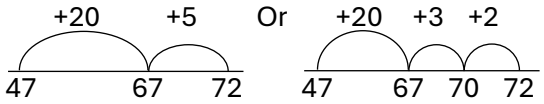
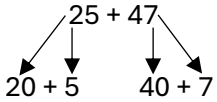
YEAR 1 - ADDITION

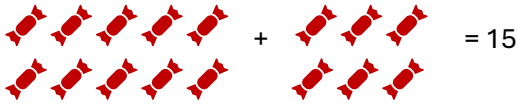
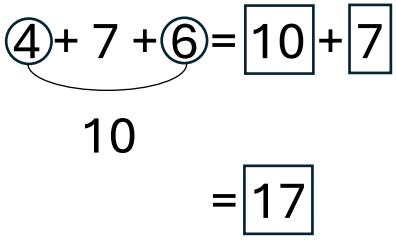
Objective/Strategy	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model	 Use part, part whole model. Use cubes to add two numbers together as a group or in a bar.  	Use pictures to add two numbers together as a group or in a bar.  	**8 = 5 + 3** **5 + 3 = 8**  Use the part part whole diagram as shown above to move into the abstract. Include missing number questions to support varied fluency: **8 = ? + 3** **5 + ? = 8**
Starting as the bigger number and counting on	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	 12 + 5 = 17 Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.

Regrouping to make 10. *This is an essential skill for column and addition later.*	 10 + 2 = 12  Start with the bigger number and use the smaller number to make 10. Use ten frames.	 3 + 9 = Use pictures or a number line. Regroup or partition the smaller number using the part, part whole model to make 10. 9 + 5 = 14 1 4  	7 + 4 = 11 If I am at seven, how many more do I need to make 11? How many more do I add on now?
Represent & use number bonds and related subtraction facts within 20.	 2 more than 5	  	Include missing number questions: 8 = ? + 3 5 + ? = 8 Emphasis should be on the language *'1 more than 5 is equal to 6.'* *'2 more than 5 is 7.'* *'8 is 3 more than 5.'*

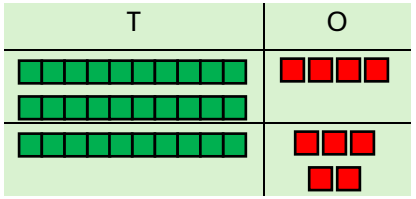
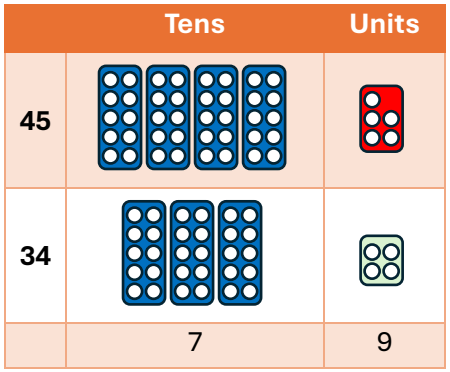
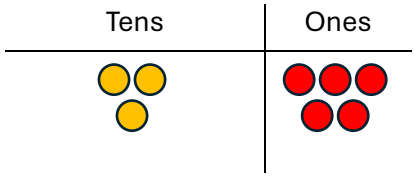
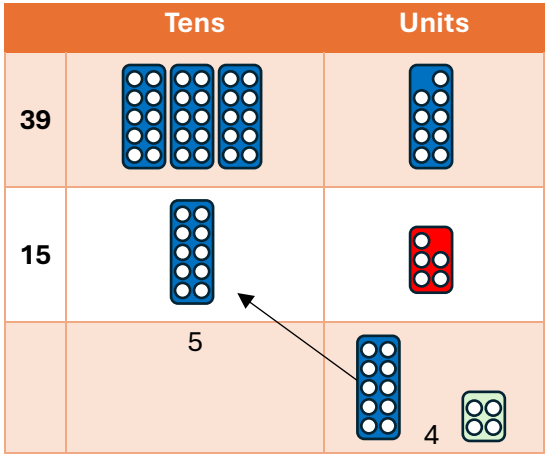
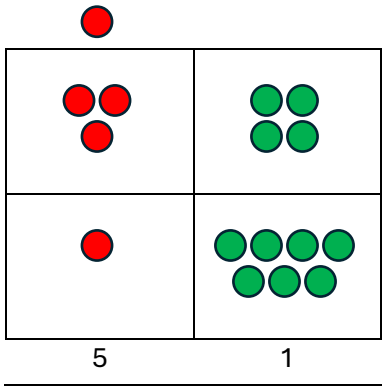
YEAR 2 - ADDITION

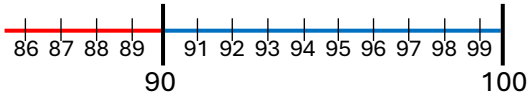
Objective/Strategy	Concrete	Pictorial	Abstract
Adding Multiples of ten	50 = 30 + 20  Model using dienes and bead strings	 3 tens + 5 tens = _____tens 30+50 = _____ Use representations for base ten.	20 + 30 = 50 70 = 50 + 20 40 + ☐ = 60
Use known number facts Part, part whole	 Children explore ways of making numbers within 20	 ☐ + ☐ = 20 20 - ☐=☐ ☐ + ☐ = 20 20 - ☐=☐	Explore commutativity of additon by swapping the addends to build a fact family. Explore the concept of the inverse relationships of addtion and subtractions and use this to check calculations. ☐ + 1 = 16 16 - 1 = ☐ 1 + ☐ = 16 16 - ☐ = 1
Using known facts		 Children draw representations of H,T and O	3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 700

Bar model	 3 + 4 = 7	 7 + 3 = 10	 23 + 25 = 48
Add two digit numbers and ones	 17 + 5 = 22 Use ten frame to make ‘magic ten Children explore the pattern. 17 + 5 = 22 27 + 5 = 32	Use part part whole and number line to model.  	17 + 5 = 22 Explore related facts 17 + 5 = 22 5 + 17 = 22 22 - 17 = 5 22 - 5 = 17  Lead into recording in coloumn format, to reinforce place value and prepare children for formal written methods with larger values.
Add a 2 digit number and tens	 25 + 10 = 35 Explore that the ones digit does not change	 	27 + 10 = 37 27 + 20 = 47 27 + □ = 57
	 Model using dienes, place value counters and numicon	 User number line and bridge ten using part whole if necessary.	 20 + 40 = 60 5 + 7 = 12 60 + 12 = 72 Lead into recording in column format to reinforce place value and prepare children for formal written methods with larger values

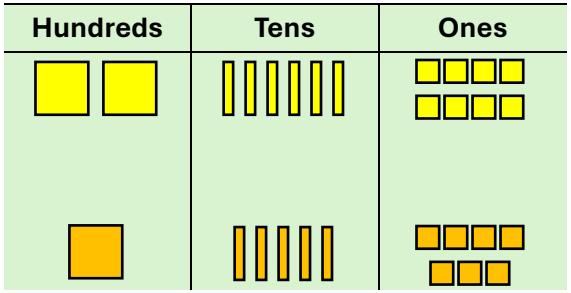
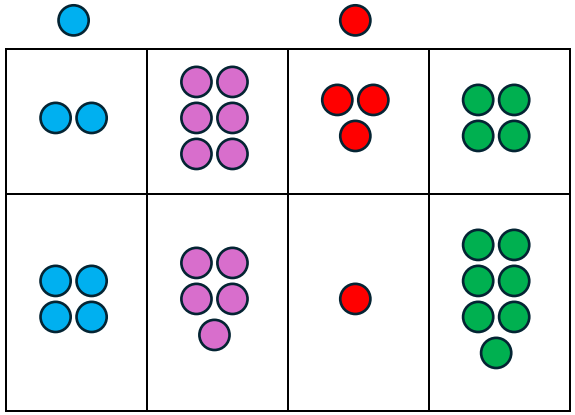
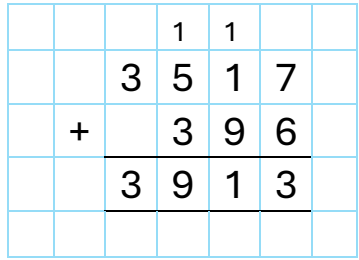
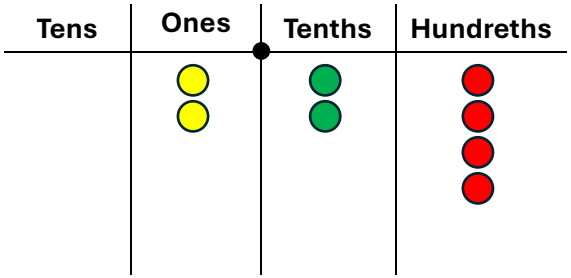
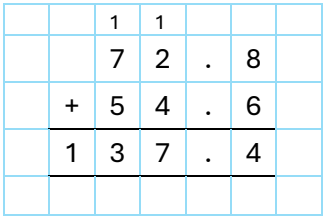
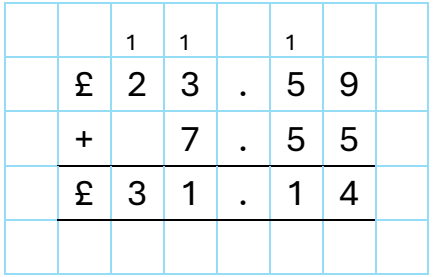
Add three 1-digit numbers	 Combine to make 10 first if possible. Or bridge 10 then add third digit	 Regroup and draw representation.  = 15	 Combine the two numbers that make/bridge ten then add on the third.

YEAR 3 - ADDITION

Objective/Strategy	Concrete	Pictorial	Abstract
Column Addition – no regrouping (friendly numbers) Add two or three 2 or 3 digit numbers.	 Dienes or numicon Add together the ones first, then the tens.  	Children move to drawing the counters using a tens and one frame.  	2 2 3 + 1 1 4 3 3 7 Add the ones first, then the tens, then the hundreds. Ensure all digits are written clearly.
	 Exchange ten ones for a ten. Model using numicon and place value counters.	 34 +17 Children can draw a representation of the grid to further support their understanding, carrying the ten above the top row.	20 + 5 60 + 8 60 + 13 = 73 1 1 536 +85 621 Start by partitioning the numbers before formal column to show the exchanghe. Always carry digits above.

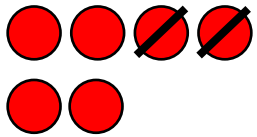
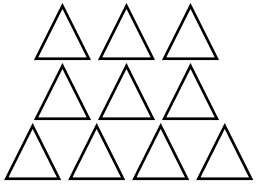
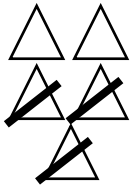
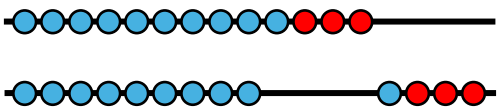
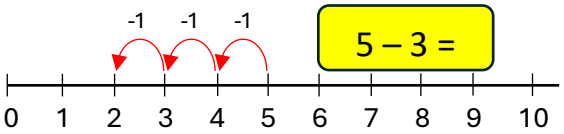
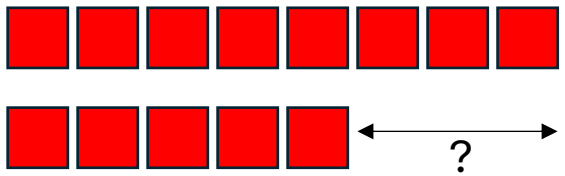
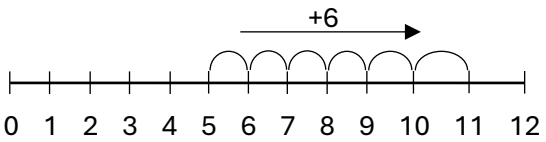
Estimate the answers to questions and use inverse operations to check answers	 Estimating 98 +17 = ? 100 + 20 = 120	Use number lines to illustrate estimation. 	Building up known facts and using them to illustrate the inverse and to check answers: 98 +18 = 116 116 – 18 = 98 18 + 98 = 116 116 – 98 = 18

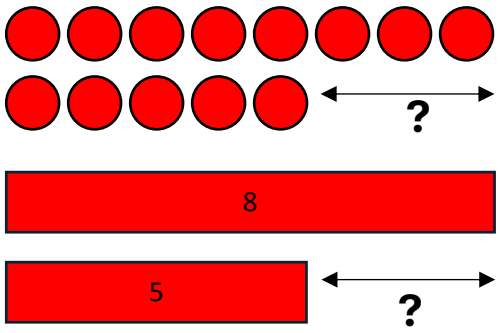
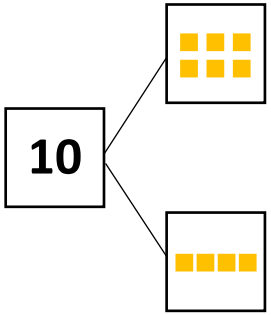
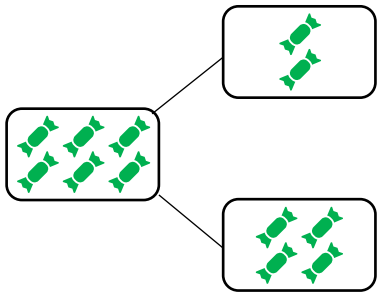
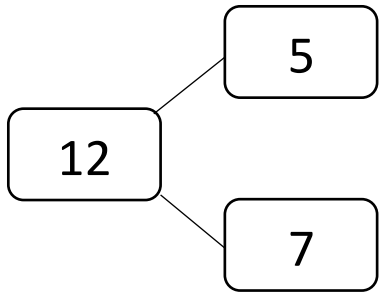
YEARS 4 – 6 - ADDITION

Objective/Strategy	Concrete	Pictorial	Abstract
Years 4 – 6 Estimate and use inverse operations to check answers to a calculation	**As per Year 3**		
Year 4 – Add numbers with up to 4 digits	Children continue to use dienes or place value counters to add, exchanging ten ones for a ten and ten tens for a hundred and ten hundreds for a thousand 	 Draw representations using place value grid.	 Continue from previous work to carry hundreds as well as tens. Carry above. Relate to money and measures.
Year 5 – add numbers with more than 4 digits. Add decimals places, including money.	As year 4 	Form clear understanding of decimal point.	  Carry at the top.

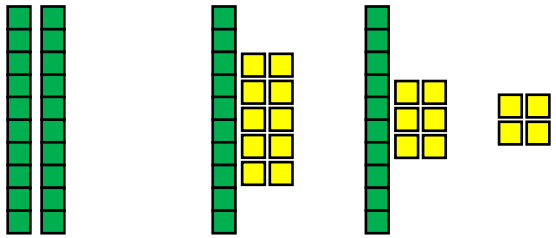
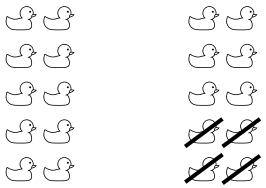
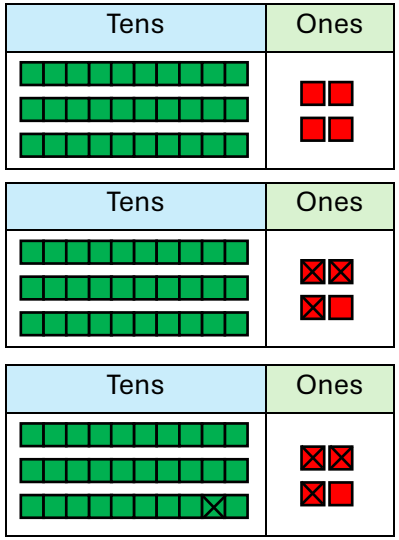
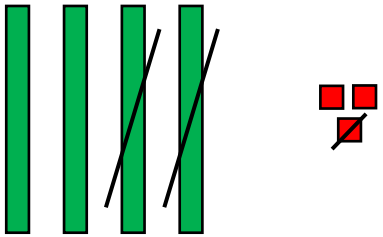
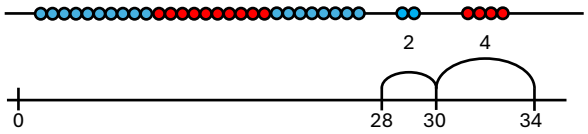
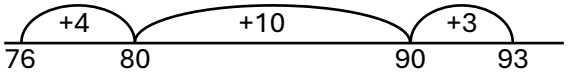
Year 6 – Add several numbers of increasing complexity, including adding money, measure and decimals with different numbers of decimal points	As Year 5	As Year 5	Insert zeros for place holders. Carry at top of sum. 1 1 1 1 8 1 0 5 9 3 6 6 8 1 5 3 0 1 + 2 0 5 5 1 1 2 0 5 7 9 2 1 2 2 3 . 3 6 1 9 . 0 8 0 5 9 . 7 7 0 + 1 . 3 0 0 9 3 . 5 1 1

YEAR 1 - SUBTRACTION

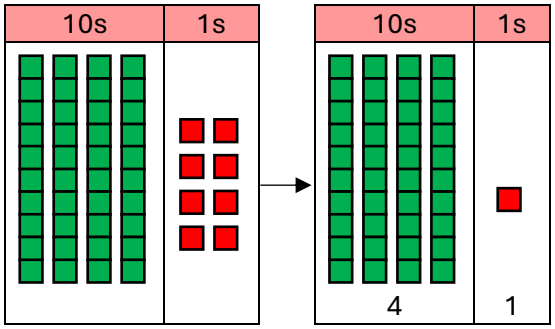
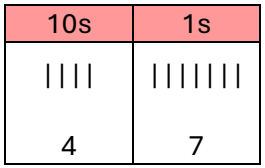
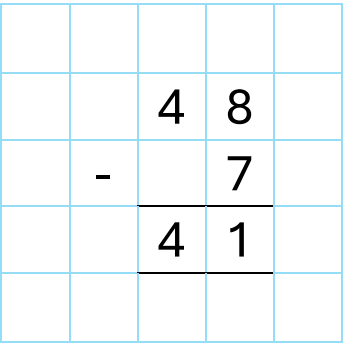
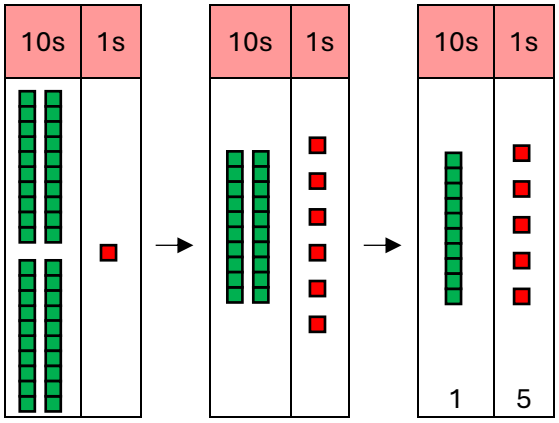
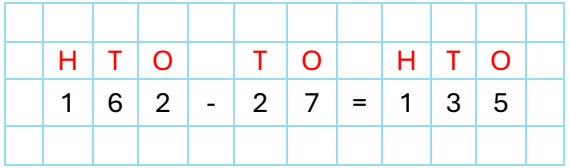
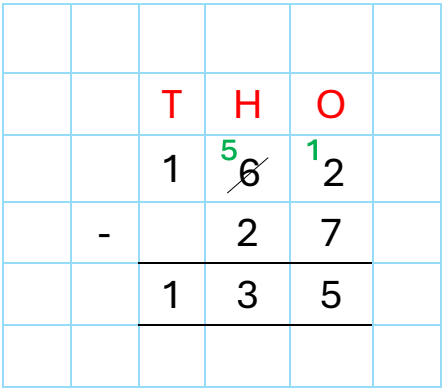
Objective/Strategy	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away. 4 – 2 = 2  4 – 2 = 2 	Cross out drawn objects to show what has been taken away.   15 – 3 = 12	7 – 4 = 3 16 – 9 = 7
Counting back	 Move objects away from the group, counting backwards.  Move the beads along the bead string as you count backwards	 Count back in ones using a number line.	Put 13 in your head, count back 4. What number are you at?
Find the difference	Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5: 	Count on using a number line to find the difference. 	Hannah has 12 sweets and her sister has 5. How many more does Hannah have than her sister?

		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.
Represent and use number bonds and related subtraction facts within 20 (Part part whole model)	Link to addition – use the PPW model to model the inverse.  If 10 is the whole and 6 is one of the parts, what is the other part? 10 – 6 = 4	Use pictorial representations to the parts. 	Move to using numbers within the part whole model. 

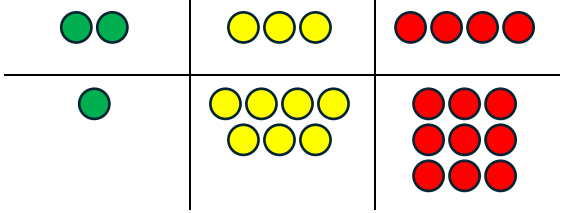
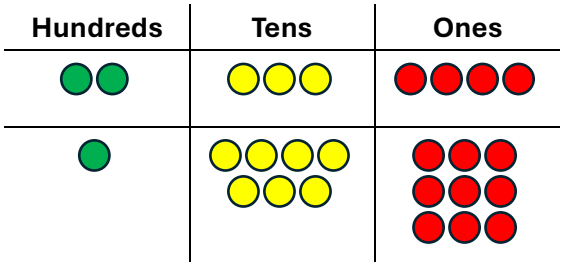
YEAR 2 - SUBTRACTION

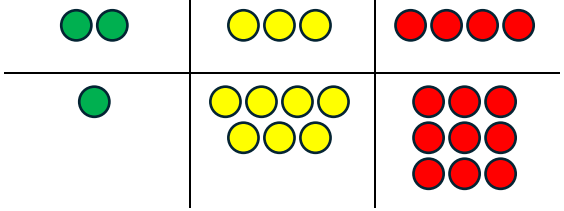
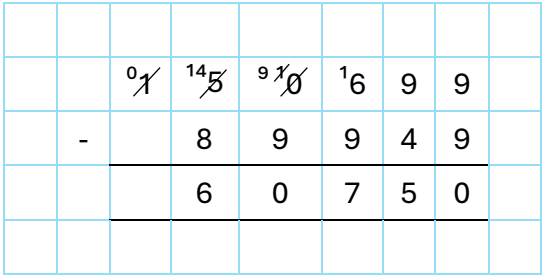
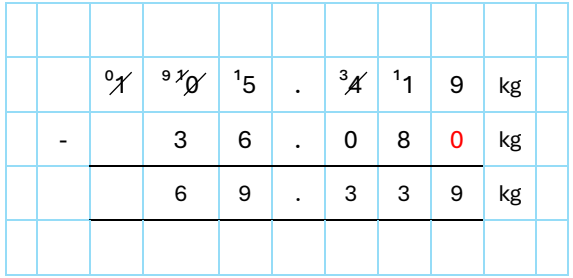
Objective/Strategy	Concrete	Pictorial	Abstract
Regroup a ten into 10 ones	 Use a PV chart to show how to change a ten into ten ones, use the term 'take and make'	 20 – 4 =	20 – 4 = 16
Partitioning to subtract without regrouping. *'Friendly numbers'*	34 – 13 = 21  Use Dienes to show how to partition the number when subtracting without regrouping.	Children draw representations of Dienes and cross off.  43 – 21 = 22	43 – 21 = 22
Make ten strategy *Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.*		 'Counting on' to find 'difference' Use a number line to count on to next ten and then the rest.	93 – 76 = 17

YEAR 3 - SUBTRACTION

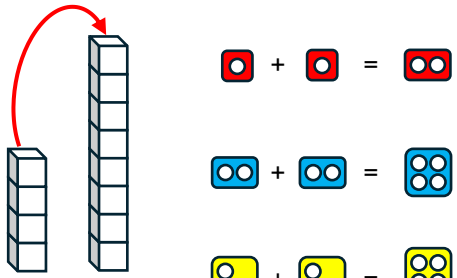
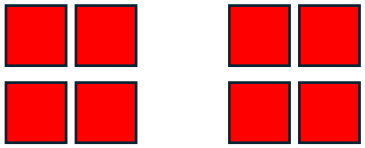
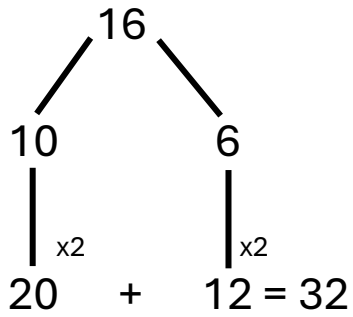
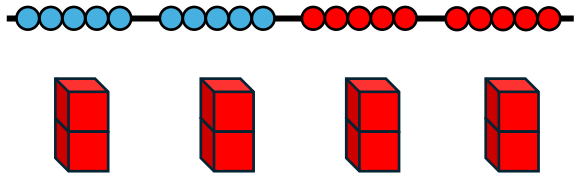
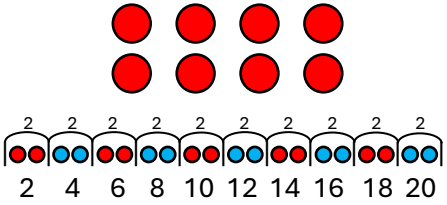
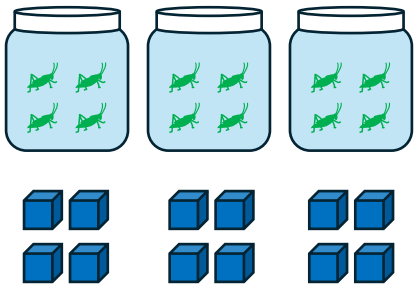
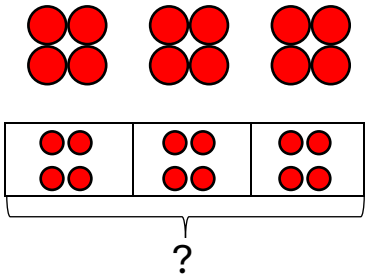
Objective/Strategy	Concrete	Pictorial	Abstract
Column subtraction without regrouping.		Children to represent base 10 pictorially. 	Column method or children could count back 7. 
Column subtraction with regrouping.	Column method using base 10 and having to exchange. 41 – 26 = 		Formal column method using 'Steps to Success'. Children must understand what has happened when they have crossed out digits.  

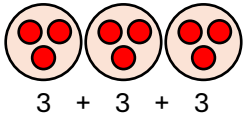
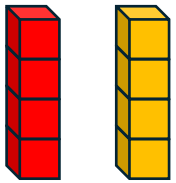
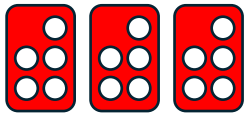
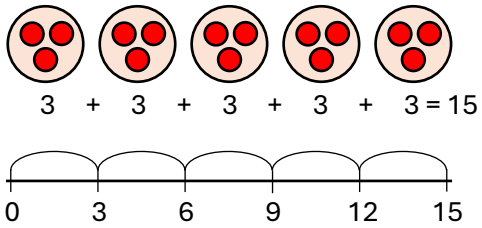
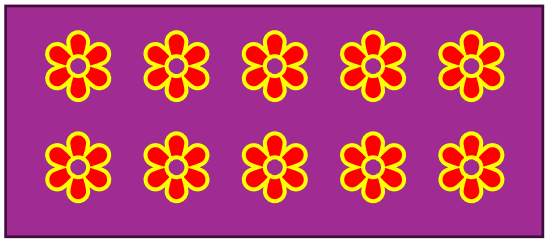
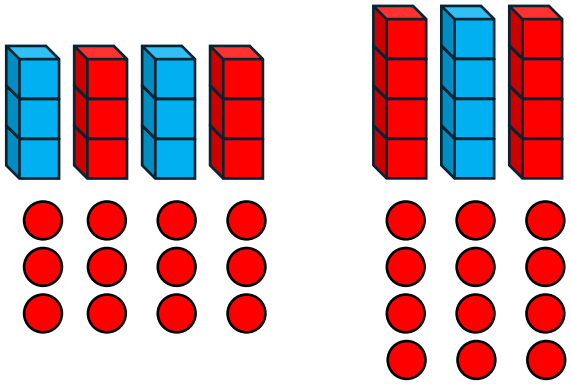
YEARS 4 – 6 - SUBTRACTION

Objective/Strategy	Concrete	Pictorial	Abstract
Year 4 – Subtracting tens and ones – up to 4 digits. (introduce decimal subtraction through context of money)	Model process of exchange using numicon, base ten and then move to place value counters. 234 – 179 = Hundreds | Tens | Ones 	Children to draw place value counters and show their exchange – see Year 3	Formal column method. Children must understand what has happened when they have crossed out digits. $\begin{array}{r} {}^{6}\cancel{7}\,{}^{1}5\,4 \\ +\ 1\,5\,6\,2 \\ \hline 1\,1\,9\,2 \end{array}$
Year 5 – Subtract with at least 4 digits, including money and measures. (subtract with decimal values, including mixtures of integers and decimals and aligning the decimal)	Model process of exchange using numicon, base ten and then move to place value counters. 234 – 179 = Hundreds | Tens | Ones 	Children to draw place value counters and show their exchange – see Year 3	Formal column method. Children must understand what has happened when they have crossed out digits. Use zeros for place holders. $\begin{array}{r} {}^{2}\cancel{3}\,{}^{10}\cancel{1}\,{}^{1}0\,{}^{4}\cancel{5}\,{}^{1}6 \\ -\ 2\,1\,2\,8 \\ \hline 2\,8\,9\,2\,8 \end{array}$ $\begin{array}{r} {}^{6}\cancel{7}\,{}^{10}\cancel{1}\,{}^{1}6\,{}^{8}\cancel{9}\,.\,{}^{1}0 \\ -\ 3\,7\,2\,.\,5 \\ \hline 6\,7\,9\,6\,.\,5 \end{array}$

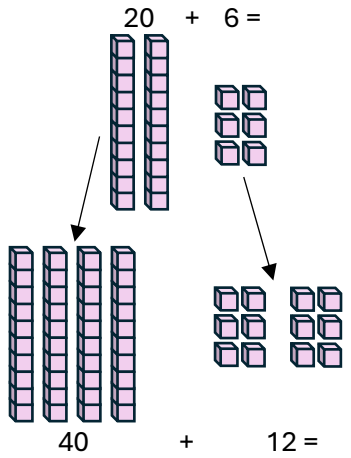
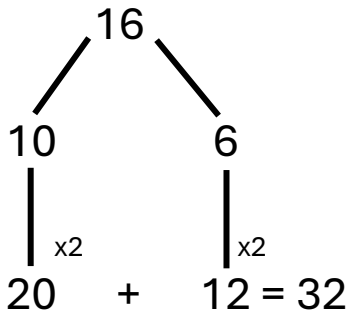
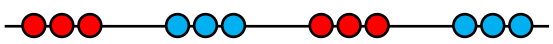
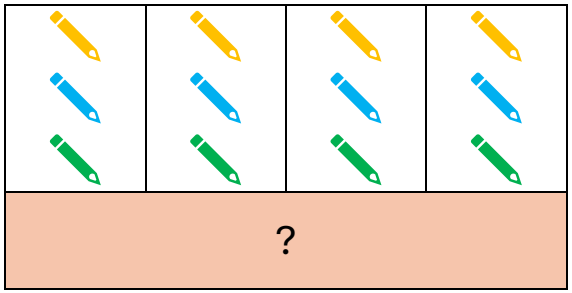
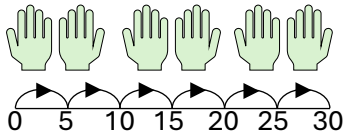
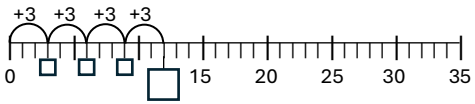
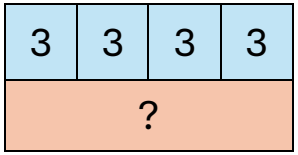
Year 6 – Subtract with increasingly large, more complex numbers and decimal values	Model process of exchange using numicon, base ten and then move to place value counters. 234 – 179 = **Hundreds** / **Tens** / **Ones** 	Children to draw place value counters and show their exchange – see Year 3	Increasingly large and more complex numbers.  

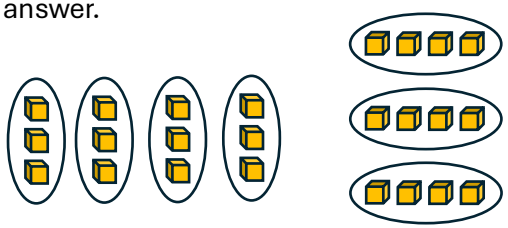
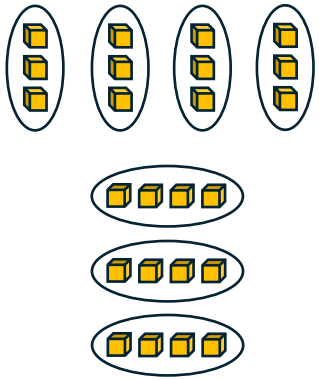
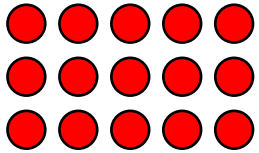
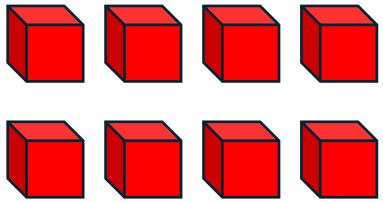
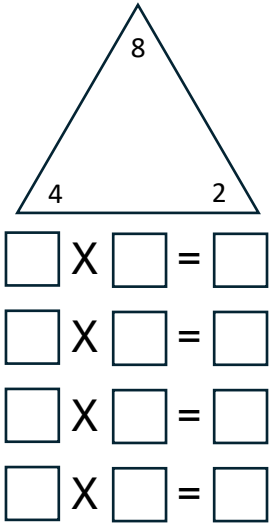
YEAR 1 - MULTIPLICATION

Objective/Strategy	Concrete	Pictorial	Abstract
Doubling Numbers	Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling.  Double 4 is 8 4 x 2 = 8	Draw pictures to show how to double numbers. Double 4 is 8 	Partition a number and then double each part before recombining it back together. 
Counting in multiples	Count the group as children are skip counting, children may use their fingers to help. 	Children make representations to show counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10 , 15, 20, 25, 30
Repeated grouping/ repeated addition	There are 3 equal groups, with 4 in each group. 3 x 4 = 4 + 4 + 4 = 	Children to represent the practical resources in a picture and use a bar model. 	3 x 4 = 12 4 + 4 + 4 = 12

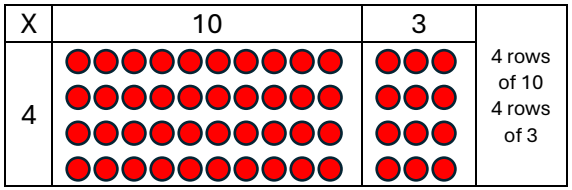
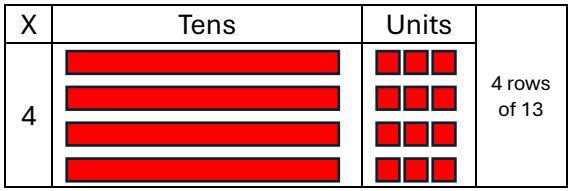
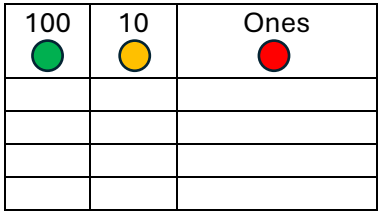
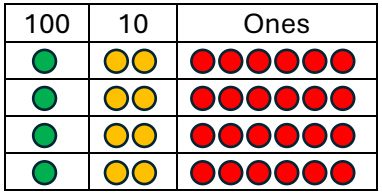
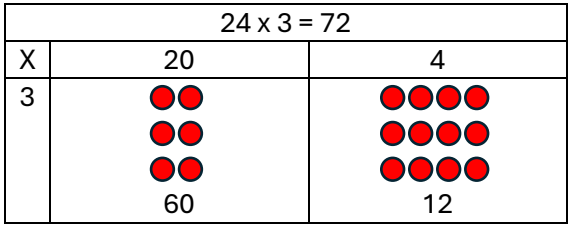
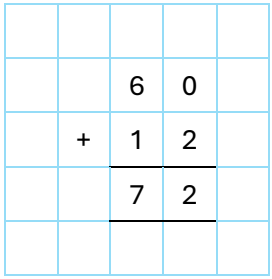
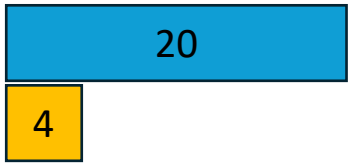
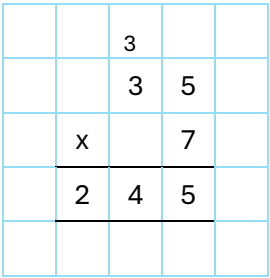
Repeated addition	   Use different objects to add equal groups	Use pictorial including number lines to solve problems. There are 3 sweets in one bag. How many sweets are in 5 bags altogether? 	Write addition sentences to describe objects and pcitures.  2 + 2 + 2 + 2 + 2 = 10
Understanding arrays	Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc. 	Draw representations of arrays to show understanding. 	3 x 2 = 6 2 x 5 = 10

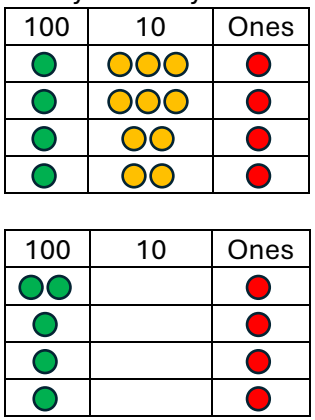
YEAR 2 - MULTIPLICATION

Objective/Strategy	Concrete	Pictorial	Abstract
Doubling Numbers	Model doubling using dienes and place value counters. Doubling 26 	Draw pictures and representations to demonstrate how to double numbers.	Partition a number and then double each part before recombining it back together. 
Counting in multiples of 2, 5 and 10 from 0. (repeated addition)	Count the groups as children are skip counting, children may use their fingers to help. Progress onto bar models.   	Number line, counting sticks and bar models should be used to how representation of counting in multiples.   	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2 , 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25, 30 4 x 3 =

Multiplication is commutative	Create arrays using counters and cubes and Numicon.  Pupils should understand than an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer. 	Use representations or arrays to show different calculations and explore commutativity. 	Use an array to write multiplication setences and reninforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15
Using the Inverse *This should be taught alongside division, so pupils learn how they work alongside each other.*			2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8 ÷ 2 Show all related fact family sentences.

YEAR 3 - MULTIPLICATION

Objective/Strategy	Concrete	Pictorial	Abstract
Grid method, progressing to the formal method Multiply 2 digit numbers by 1 digit numbers	Show the links with arrays to first introduce the grid method   Move onto base ten to move towards a more compact method Move onto place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.  <u>Calculations</u> 4 x 126  <u>Calculations</u> 4 x 126 Fill each row with 126.	Children can represent their work with place value counters in a way that they understand. 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 below.   Bar models are used to explore missing numbers. 4 x □ = 20 	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. | X	30	5
---	---	---
7	210	35	 210 + 35 = 245 Move forward to the formal written method:  Remember to carry at the top.

<table>
<tr>
<td></td>
<td>Add up each column, starting with the ones making any exchanges needed.
Then you have your answer.
 
</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solve problems, including missing number problems, integer scaling problems,</td>
<td></td>
<td></td>
<td>Three times as high, eight times as long

? x 5 = 20

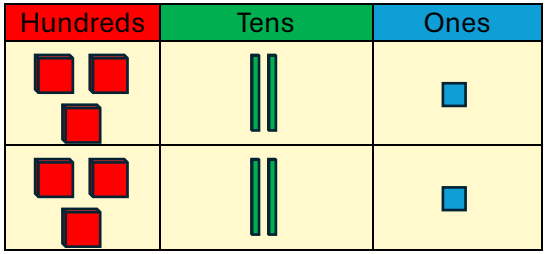
20 ÷ ? = 5

3 hats and 4 coats, how many different outfits?</td>
</tr>
</table>

YEARS 4 – 6 - MULTIPLICATION

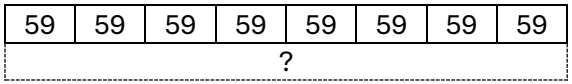
Objective/Strategy	Concrete	Pictorial	Abstract
The grid method (recap from Year 3 for 2 digit x 1 digit). Children progress to multiplying 2 digit numbers by 1 digit (Year 4 expectation).	Use place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows. 100 | 10 | Ones 4 rows of: 1 green, 2 yellow, 6 red Calculations 4 x 126 Fill each row with 126. 100 | 10 | Ones 4 rows of: 1 green, 3 yellow, 1 red 4 rows of: 1 green, 2 yellow, 1 red 100 | 10 | Ones 4 rows of: 2 green, 1 red Add up each column, starting with the ones making any exchanges needed.	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking. 24 x 3 = 72 X | 20 | 4 3 | 3 rows of 2 red counters = 60 | 3 rows of 4 red counters = 12 6 0 + 1 2 7 2	Multiply 3 digit by 1 digit numbers using the grid method. X | 3000 | 20 | 7 4 | 1200 | 80 | 28 1200 + 80 + 28 = 1,308

<table>
<tr>
<td>Column multiplication</td>
<td>Children can continue to be supported by place value counters at this stage of multiplication. This is initially done where there is no regrouping.

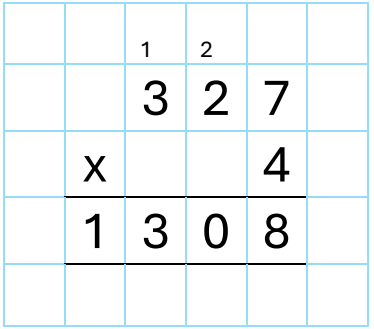
It its important at this stage that they always multiply the ones first.

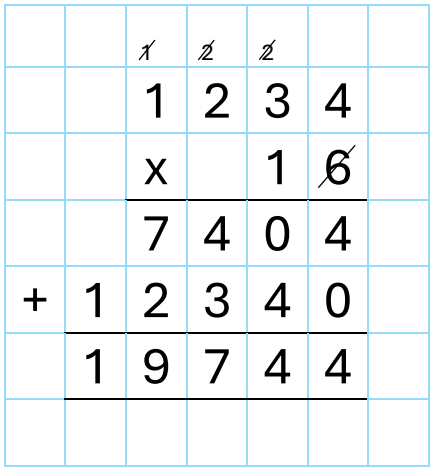
The corresponding long multiplications is modelled alongside.</td>
<td><table>
<tr><td>X</td><td>3000</td><td>20</td><td>7</td></tr>
<tr><td>4</td><td>1200</td><td>80</td><td>28</td></tr>
</table>
This grid method may be used to show how this relates to a formal written method.

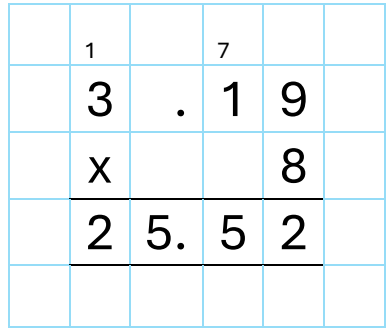
 

8 x 59
8 x 60 – 8
8 x 6 = 48
8 x 60 = 480
480 – 8 x 472

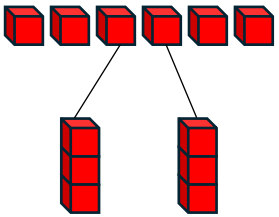
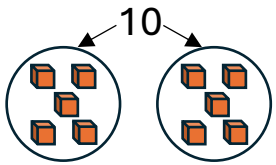
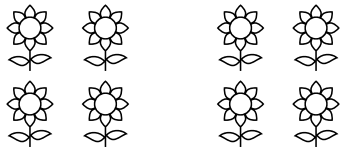
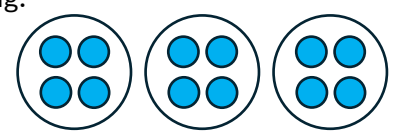
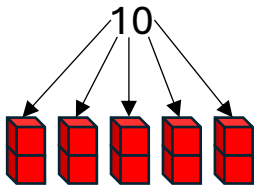
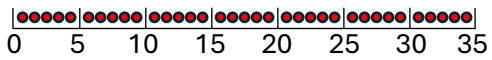
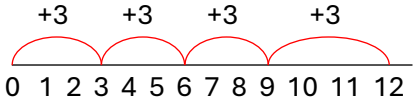
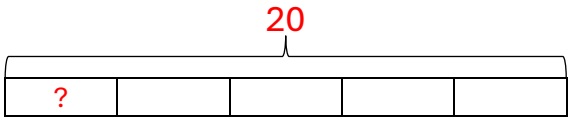
Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.</td>
<td>This may lead to compact method - always carry at the top.

 
</td>
</tr>
<tr>
<td>Colum Multiplication – Long multiplication.</td>
<td>Manipulatives may still be used with the corresponding long multiplication modelled alongside.</td>
<td></td>
<td>Progress to using the column method for long multiplication.

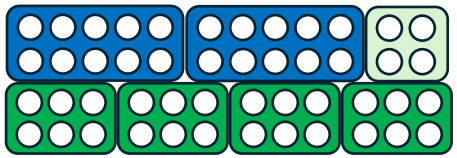
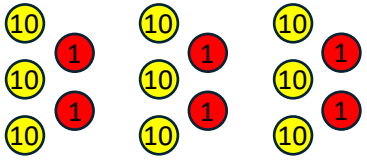
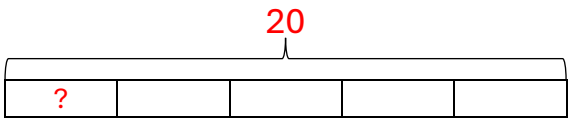
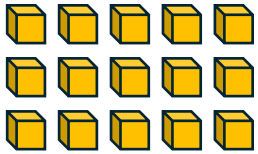
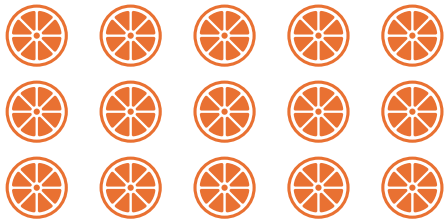
 
</td>
</tr>
</table>

Multiplying decimals up to 2 decimal places by a single digit.			Always carry at the top. 

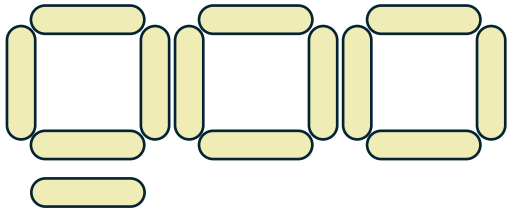
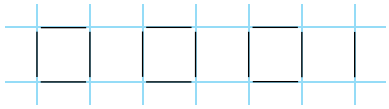
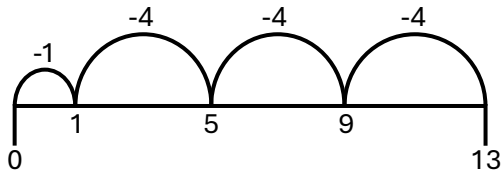
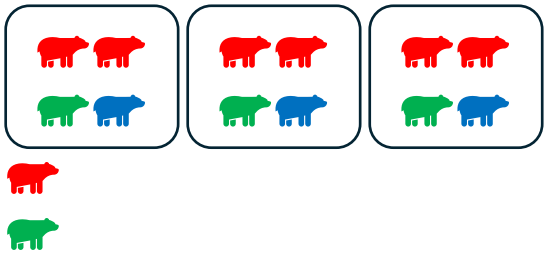
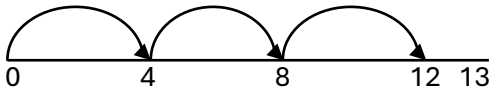
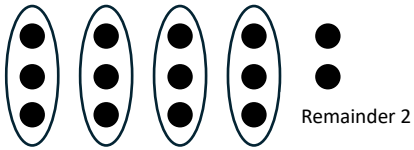
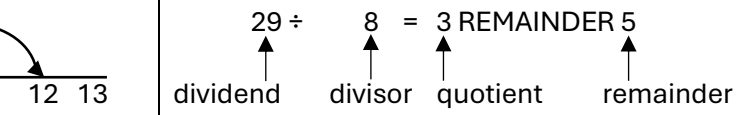
YEAR 1 - DIVISION

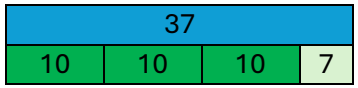
Objective/Strategy	Concrete	Pictorial	Abstract
Division as sharing	Sharing using a range of objects: 6 ÷ 2 =   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 shared between 2 is 4 Sharing:  12 shared between 3 is 4	12 shared between 3 is 4
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.   	User number lines for grouping   12 ÷ 3 = 4 Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group  20 ÷ 5 = ? 5 x ? = 20	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?

YEAR 2 - DIVISION

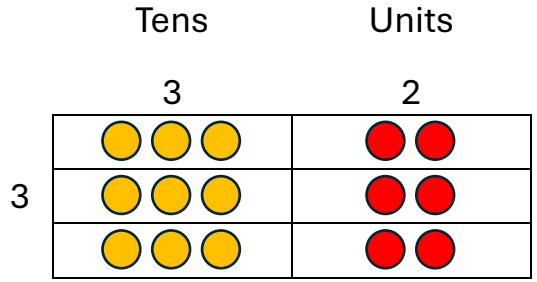
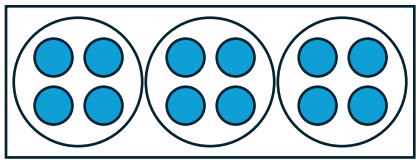
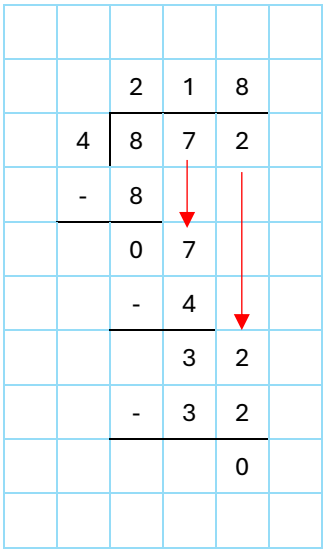
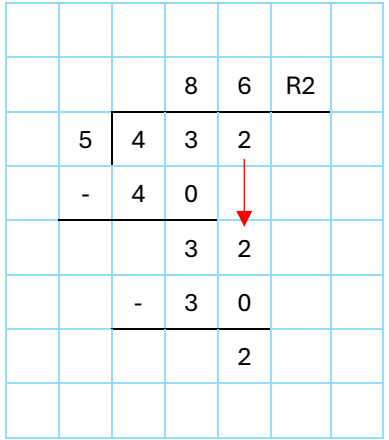
Objective/Strategy	Concrete	Pictorial	Abstract
Division as grouping	Use cubes, counters, objects or place value counters to aid understanding.  24 divided into groups of 6 = 4 96 ÷ 3 = 32  	Continue to use bar modelling to aid solving division problems  20 ÷ 5 = ? 5 x ? = 20	How many groups of 6 in 24? 24 ÷ 6 = 4
Counting in multiples of 2, 5 and 10 from 0. (repeated addition)	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Example: 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Draw an array and use lines to split the array into groups to make multiplication and division sentences 	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4

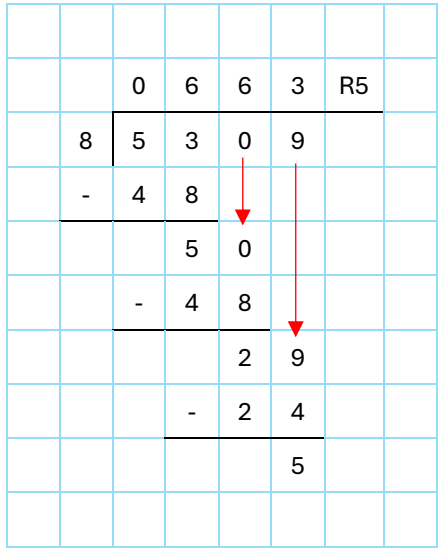
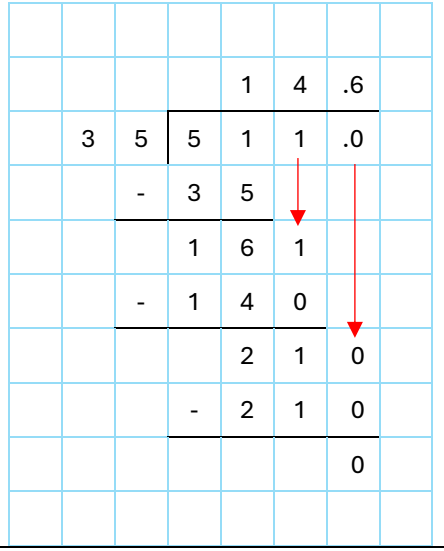
YEAR 3 - DIVISION

Objective/Strategy	Concrete	Pictorial	Abstract
Division with remainders	This can be done with lollipop sticks or Cuisenaire rods: 13 ÷ 4  Use of lollipop sticks for 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 tables facts; they could also represent repeated addition on a number line:  '3 groups of 4, with 1 left over'
Division with remainders	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dot and group them to divide an amount and clearly show a remainder.  	Complete written divisions and show the remainder using r. 

		Use Bar models to show division with remainders.  Remainder: 5s in 40? 5+ 5 + 5 + 5 + 5 + 5 + 5 + 5 = 8 0 5 10 15 20 25 30 35 40 Remainder: 6+ 6 + 6 + 6 + 6 + 6 = 6 sixes with 0 6 12 18 24 30 38	

YEARS 4 – 6 - DIVISION

Objective/Strategy	Concrete	Pictorial	Abstract
Divide at least 3 digit numbers by 1 digit.	96 ÷ 3 	Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  Encourage them to move towards counting in multiples to divide more efficiently.	Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder. 

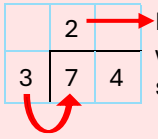
			 Finally move into decimal places to divide the total accurately. 

YEAR 6 - DIVISION

Objective/Strategy		
Long division with remainder.	Begin by modelling method with a 1-digit divisor.	**Divide** – the number inside the house with the number outside of the house. Put the answer on top. **Multiply** – the number outside of the house by the number on top of the house. Put this answer below the number inside the house. **Subtract** – the number inside the house from the number below the inside number. **Bring down** – the next number in the dividend. **Repeat** – all the steps repeated as many times as needed until you get down to 0. If there is a leftover this is your remainder. When moving onto using long division with a 2-digit divisor, children can write out multiples first: 2, 2, 6, 7, 1, 0 22, 44, 66, 88, 110 etc

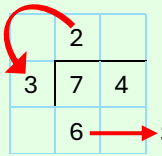
Long Division

Divide:



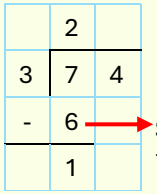
Dividing 7 tens by 3, we get 2 tens, and some extra

Multiply:



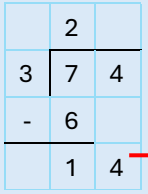
3 x 2 tens = 6 tens.

Subtract:



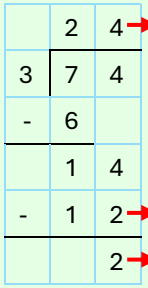
Subtracting 6 tens from 7 tens.

Bring down:



1 ten 4 ones = 14 ones

Repeat or find the Remainder:



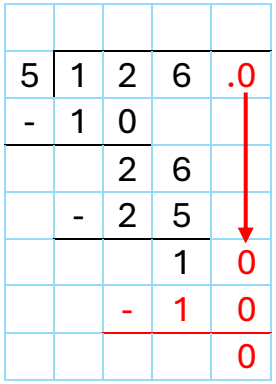
Dividing 14 ones by 3
We get 4 ones and some extra

3 x 4 ones = 12 ones.

Remainder

Check:

Check your answer:
Dividend = Divisor x Quotient + Remainder

Long division with decimal remainders	 When there is a remainder which you need to write as a decimal, bring down the 0 in the tenths column, and repeat the process as before.	

How to Calculate Fractions

Begin with real life: The children themselves form the best introduction.

- One class is the whole.
- Number of children is the denominator.
- Group focused on is the numerator.

For example: Class of 28: One class = The Whole

28 children → 28 = Denominator
15 boys → 15 ← Subject
28 ← Total in group

Move on to dividing into groups using fraction vocab.
10 pieces in a satsuma – How many pieces in half the satsuma?
How many pieces is one fifth/quarter/third of the satsuma?

Give children pencils, cubes, fruit, sweets etc to create fractions.

Calculating Fraction Amounts

Children learn there are 2 steps:

- Step 1 – Divide the number by the denominator
- Step 2 – Multiply your answer by the numerator

For example: $\frac{3}{4}$ of 28

- 28 ÷ 4 = 7 (number ÷ denominator)
- 7 x 3 = 21 (answer x numerator)
- So $\frac{3}{4}$ of 28 = 21

Adding Fractions	Subtracting Fractions
$\frac{1}{2} + \frac{2}{3} = \frac{3}{6} + \frac{4}{6} = \frac{7}{6} = 1\frac{1}{6}$ L.C.D = 6 → 6 ÷ 2 = 3 → 3 x 1 = 3 → 6 ÷ 3 = 2 → 2 x 2 = 4	$\frac{5}{7} - \frac{1}{3} = \frac{15}{21} - \frac{7}{21} = \frac{8}{21}$ L.C.D = 21 → 21 ÷ 7 = 3 → 3 x 5 = 15 → 21 ÷ 3 = 7 → 7 x 1 = 7
Multiplying Fractions	**Dividing Fractions**
Numerator x Numerator Denominator x Denominator $\frac{1}{5} \times \frac{1}{4} = \frac{1 \times 1}{5 \times 4} = \frac{1}{20}$	Flip the second fraction and multiply $\frac{2}{5} \div \frac{1}{4}$ $\frac{2}{5} \times \frac{4}{1} = \frac{8}{5} = 1\frac{3}{5}$

How to Calculate Percentages

This concept is introduced after fractions are secure so children can see the links and they can use specific skills where needed.

Begin by linking to fractions: the whole is 100%
So everything is part of 100.
Show lots of examples using money and shopping.

Make the connections between fractions, decimals and percentages.

Fraction	Percentage	Decimal
Half $\frac{1}{2}$	50%	0.5
Quarter $\frac{1}{4}$	25%	0.25
3 Quarters $\frac{3}{4}$	75%	0.75
Tenth $\frac{1}{10}$	10%	0.1
Hundredth $\frac{1}{100}$	1%	0.01

Key Percentages
To work out 10% we divide the number by 10 (refer to place value chart)

- Question – 10% of £1.50
- Calculation – 1.50 ÷ 10 = 0.15
- So 10% of £1.50 = 15 pence

To work out 1%. We divide the number by 100 (refer to place value chart)

- 1% of 200
- 200 ÷ 100 = 2

To work out 50%, 25% or 75% teach children to use their factions knowledge.

To work out 15% of an amount – calculate 10% and halve it to make 5%. Add these together.

To work out a multiple of 10, for example 20%, 30% etc. Calculate 10% and multiply by the multiple.
For example:

- 30% of 500
- 500 ÷ 10 = 50
- 50 x 3 = 150
- So 30% of 500 = 150