Calculation Policy

This policy has been largely adapted from the White Rose Maths Hub Calculation Policy with further material added. It is a working document and will be revised and amended as necessary.
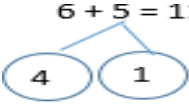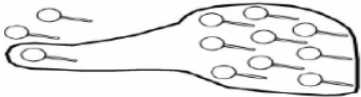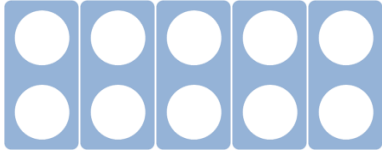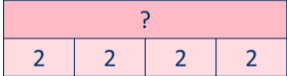
CALCULATION   GUIDANCE: Addition

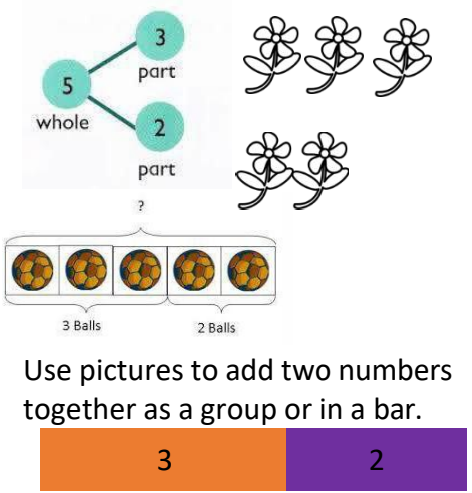|	Objective	Concrete	Pictorial	Abstract
SS1	Add 1 to a group and count total.	First… Then 1 more came. Now…		
SS2	Combine two groups to find how many altogether (Up to 10 total)	There are.. There are.. There are… altogether.		4 + 1 = 5 4 + 5 = 9
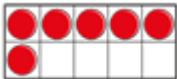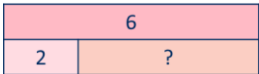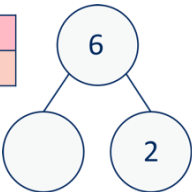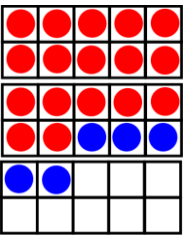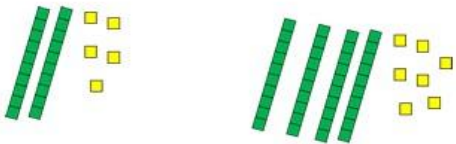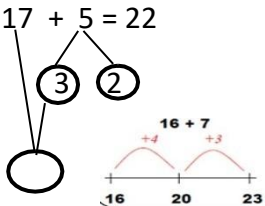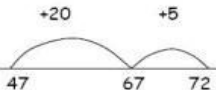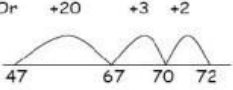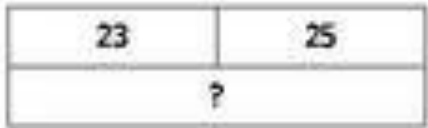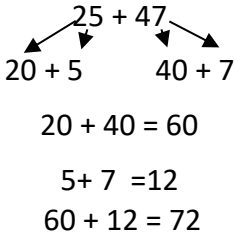
CALCULATION   GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
SS3	Number bonds of 5, 6, 7, 8, 9 and 10	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.	2 + 3 = 5 3 + 2 = 5 5 = 3 + 2 5 = 2 + 3 Use the part-part-whole diagram as shown above to move into the abstract.
	Add using 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.	Use a number line to count on in ones.	5 + 3 = 8 Place the larger number in your head and count on the smaller number to find your answer.
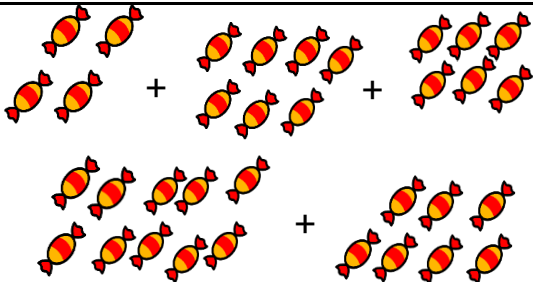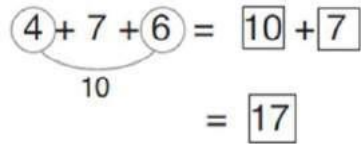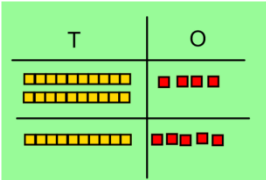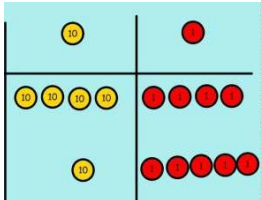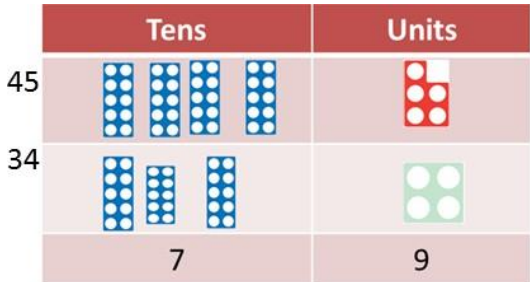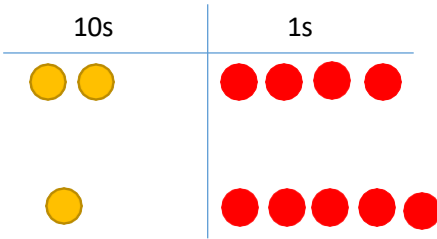
CALCULATION   GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
SS3	Add up to 20 by Regrouping to make 10	6 + 5 = 11 Start with the bigger number and use the smaller number to make 10.	Regroup or partition the smaller number using the part part whole model to make 10. 6 + 5 = 11 4 1 6 + 4 =10 10 + 1 = 11 3 + 9 =	6 + 5 = 11 7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?
	Add Multiples of 2	Model using real items eg, numicon, dienes and bead strings	Use representations for 2s	? 2 2 2 2

CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
SS3	Solve one step problems including missing number problems.	$6 + \boxed{} = 10$ $10 - \boxed{} = 6$	… plus … is equal to … $2 + \boxed{} = 6$ $6 = 2 + \boxed{}$ 0 1 ② 3 4 5 ⑥ 7 8 9 10	
SS3/4 Add 2 Numbers	SS3 – Add together up to 20 SS4 – Add 2 digit numbers	$3 + 4 = 7$ Use ten frame to make magic 10. Children explore the pattern. $17 + 5 = 22$ $27 + 5 = 32$ Use dienes and Numicon	Represent as a Bar Model $7+3 = 10$ Use part part whole and number line to model. $17 + 5 = 22$ 3 2 $16 + 7$ +4 +3 16 20 23 +20 +5 47 67 72 Or +20 +3 +2 47 67 70 72	$23 + 25 = 48$ $25 + 47$ $20 + 5 \quad 40 + 7$ $20 + 40 = 60$ $5 + 7 = 12$ $60 + 12 = 72$
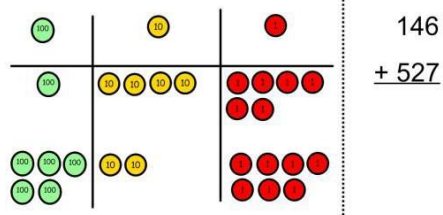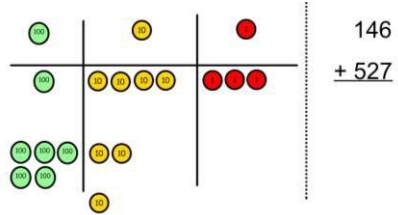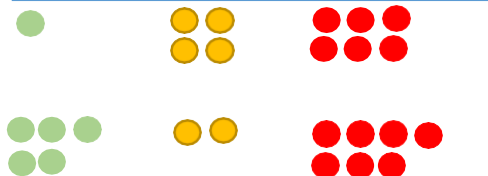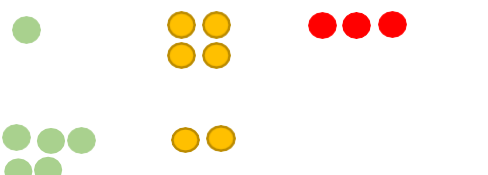
CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
SS4	Add 3 single digit numbers	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7. Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit. 7+2+ 3	 Add together three groups of objects. Draw a picture to recombine the groups to make 10.	 $4 + 7 + 6 = 10 + 7$ 10 $= 17$ Combine the two numbers that make 10 and then add on the remainder.
SS4	Add using Column method without regrouping	Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters. 24 + 15 = 44 + 15 	After physically using the numicon, base 10 blocks, and place value counters, children can draw the counters to help them to solve additions. 10s 1s 	24 + 15 = 39 24 + 15 ——— 39
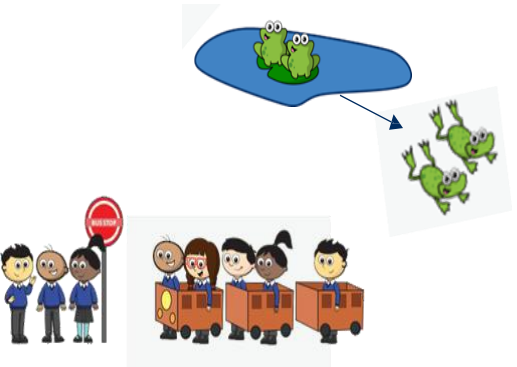
CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
SS5	Add using Column method with regrouping	Make both numbers on a place value grid. 10s 1s Add up the units and exchange 10 ones for 1 ten. 10s 1s **Tens** / **Units** 39 15 5 4	Using place value counters, children can draw the counters to help them to solve additions. 10s 1s 10s 1s 5 1 Children can draw a representation of the grid to further support their understanding, carrying the ten_ **underneath** the line	40 + 9 20 + 3 60 + 12 = 72
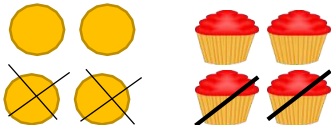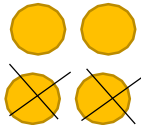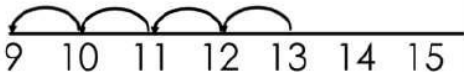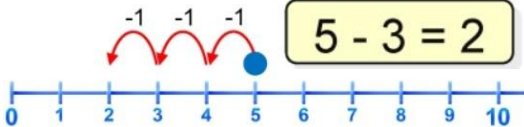
CALCULATION   GUIDANCE: Addition

	Objective				Concrete	Pictorial	Abstract
SS5/6/7	Add using Column method with regrouping	SS5 -Add two 3 digit Numbers	SS6 – Add up to 4 digit numbers, Add decimals and integers to 1dp.	SS7 – Add numbers more than 4 digits, Decimals and integers to 2dp	Make both numbers on a place value grid. Add up the units and exchange 10 ones for 1 ten. As children move on to decimals, money and decimal place value counters can be used to support learning.	100s 10s 1s 100s 10s 1s Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding. **NB** Addition of money needs to have £ and p added separately.	100 + 40 + 6 <u>500 + 20 + 7</u> 600 + 70 + 3 = 673 As the children progress, they will move from the expanded to the compacted method. ``` 146 + <u>527</u> 673 1 ``` As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.
SS8	Column method with regrouping				Consolidate understanding using numbers with more than 4 digits and extend by adding numbers with up to 3 decimal places.		
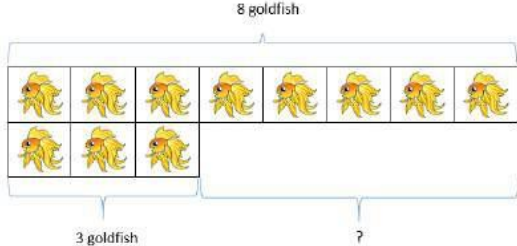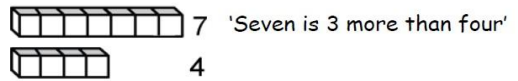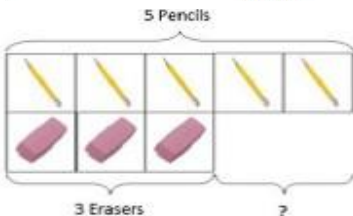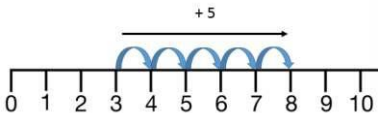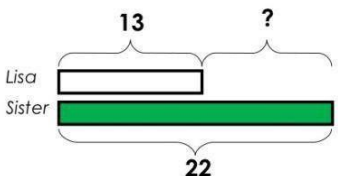
CALCULATION   GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
SS1	Removes 1 from a group and count total.	How many do we have now? 1 less than… is….		
SS2	Takes away objects to find how many are left	First… Then… Now…		
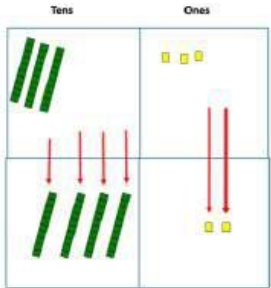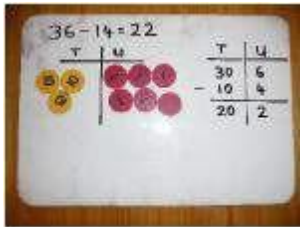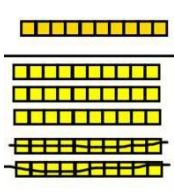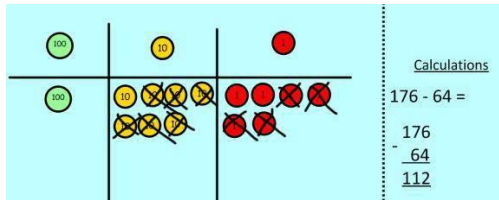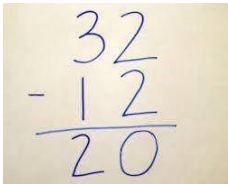
CALCULATION GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
SS3	Subtract by Taking away	Use physical objects, counters, cubes etc. to show how objects can be taken away. 4 – 2 = 2	Cross out drawn objects to show what has been taken away. 4 – 2 = 2	4 – 2 = 2
	Subtract by Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4 = 9 Move objects away from the group, counting backwards.	Count back on a number line or number track 9 10 11 12 13 14 15 Start at the bigger number and count back the smaller number, showing the jumps on the number line. -1 -1 -1 5 - 3 = 2 0 1 2 3 4 5 6 7 8 9 10	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.
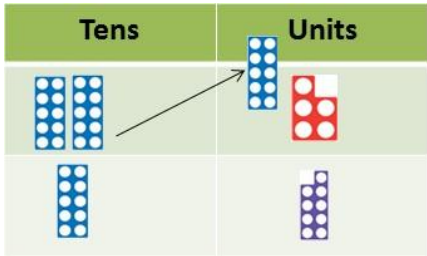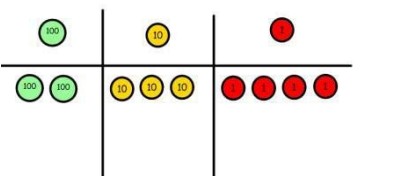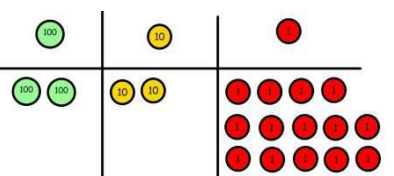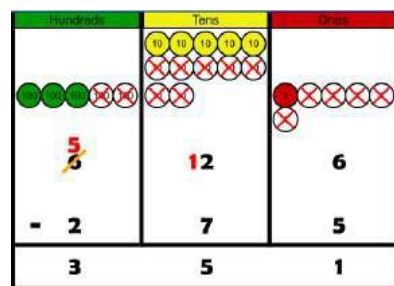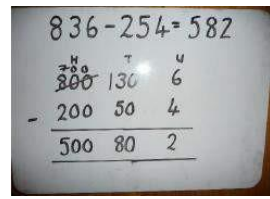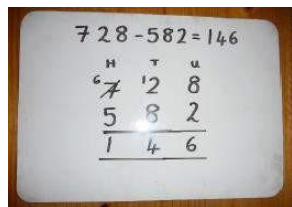
CALCULATION   GUIDANCE: Subtraction

Objective	Concrete	Pictorial	Abstract
Find the difference between amounts	Compare amounts and objects to find the difference. 8 goldfish 3 goldfish ? Use cubes to build towers or make bars to find the difference. Use basic bar models with items to find the difference. 7 'Seven is 3 more than four' 4 'I am 2 years older than my sister' 5 Pencils 3 Erasers ?	+ 5 0 1 2 3 4 5 6 7 8 9 10 Count on to find the difference. Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them. 13 ? Lisa Sister 22 Draw bars to find the difference between 2 numbers.	Hannah has 8 goldfish. Helen has 3 goldfish. Find the difference between the number of goldfish the girls have.

CALCULATION   GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
SS4	Subtract using Column method without regrouping	75 – 42 = 33 Use Base 10 to make the bigger number then take the smaller number away. Show how you partition numbers to subtract. Again make the larger number first.	Draw the Base 10 or place value counters alongside the written calculation to help to show working.	This will lead to a clear written column subtraction.

CALCULATION   GUIDANCE: Subtraction

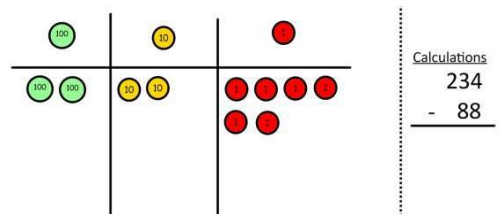|	Objective	Concrete	Pictorial	Abstract
SS5/6/7/8	**Subtract using Column method with regrouping** SS5 – Subtract 2 numbers across a 10 or a 100 (up to 2 exchanges) SS6 - Subtract up to 4 digit numbers, decimals and integers to 1dp SS7 - Subtract numbers more than 4 digits, decimals and integers to 2dp	Use Base 10 or Numicon to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters Start with the ones, can I take away 8 from 4 easily? I need to exchange 1 of my tens for 10 ones. Now I can subtract my ones.	 Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make. When confident, children can find their own way to record the exchange/regrouping. Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.	 Children can start their formal written method by partitioning the number into clear place value columns. Moving forward the children use a more compact method. This will lead to an understanding of subtracting any number including decimals.

CALCULATION   GUIDANCE: Subtraction

Now look at the tens, can I take away 8 tens easily? I need to exchange 1 hundred for 10 tens.
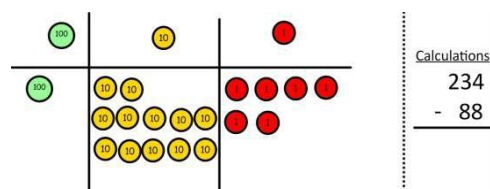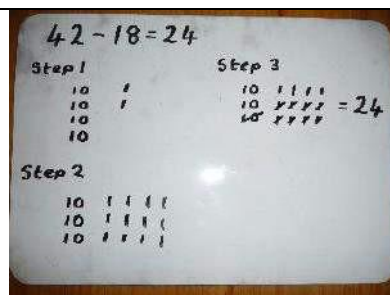

Now I can take away 8 tens and complete my subtraction.
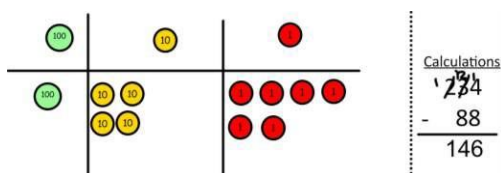
Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

$$42 - 18 = 24$$
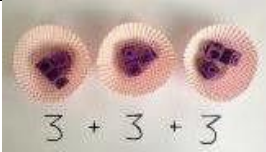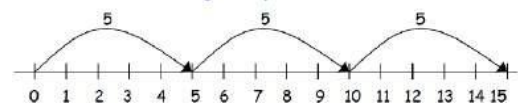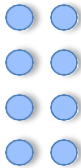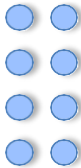
Use the phrase 'take and make' for exchange
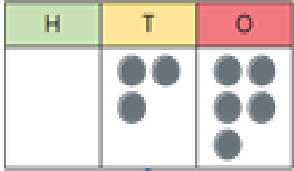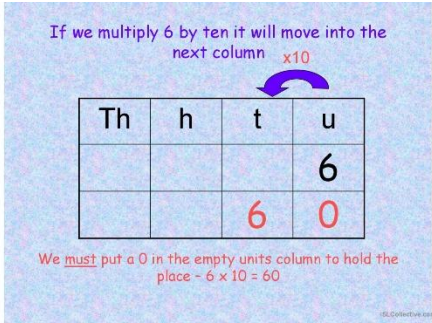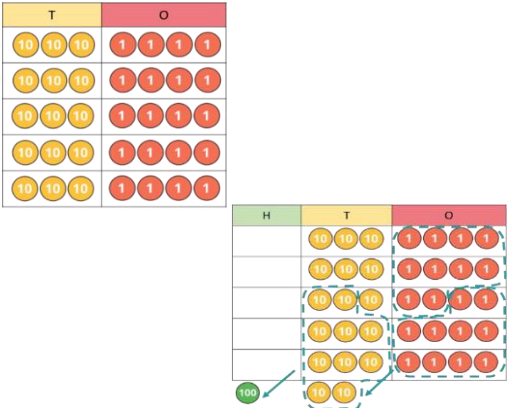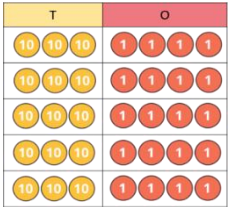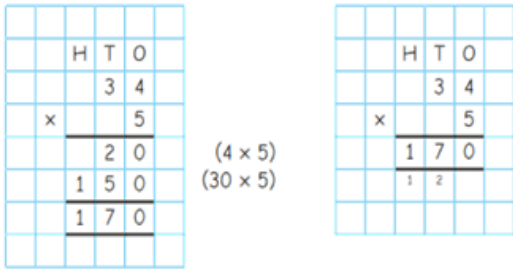
CALCULATION GUIDANCE: Multiplication

	Objective			Concrete	Pictorial	Abstract
SS2/3	**Doubles**	SS2 To 5	SS3 To 10			
SS4	Understand multiplication as repeated addition			Use different objects to add equal groups.	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there? 2 + 2 + 2 = 6 5 + 5 + 5 = 15	Write addition sentences to describe objects and pictures. 2 + 2 + 2 = 6
	To understand multiplication can be done in any order. Arrays- commutative multiplication.			Create arrays using counters/cubes to show multiplication sentences.	Draw arrays in different rotations to find **commutative** multiplication sentences. 4 × 2 = 8 2 × 4 = 8 2 × 4 = 8 4 × 2 = 8 Link arrays to area of rectangles.	Use an array to write multiplication sentences and reinforce repeated addition. 5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

CALCULATION GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
SS5	Multiply a 2 digit number by a 1 digit number (with and without exchanges) using the grid method.	Show the link with arrays to first introduce the grid method. 4 rows of 10 4 rows of 3 Move on to using Base 10 to move towards a more compact method. 4 rows of 13 Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows. Calculations 4 x 126 Fill each row with 126. Calculations 4 x 126 Add up each column, starting with the ones making any exchanges needed. $4 \times 126 = 504$	Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. $210 + 35 = 245$ Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

CALCULATION   GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
SS5	Multiply by 10	When I multiply by 10, the digits move … place value column to the left. … is 10 times the size of … 		$35 \times 10 = 350$
SS6	Multiply 2-digit numbers by a one digit number using formal written layout.	To multiply a 2-digit number by … , I multiply the ones by … and the tens by … 	Draw on whiteboards/books 	
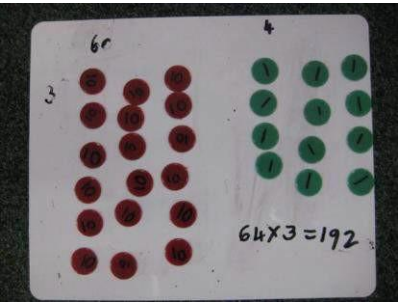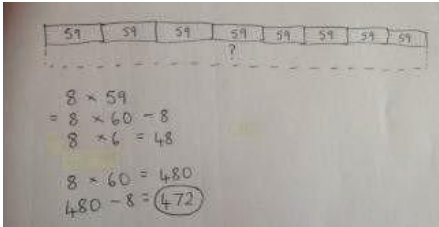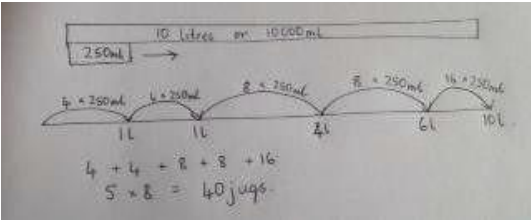
CALCULATION   GUIDANCE: Multiplication

	Objective			Concrete	Pictorial	Abstract
SS6/7/8	Multiplies decimals	SS6 – 1dp	SS7 to 2dp	SS8 – Multiples of 10	Draw in books	$6 \times 2 = 12$ $6 \times 0.2 = 1.2$
SS7/8	Multiply using the Expanded method		SS7 - Multiplies 2 and 3 digit numbers by a 2 digit number	Show the link with arrays to first introduce the expanded method.		Start with long multiplication, reminding the children about lining up their numbers clearly in columns. 18 x 13 24 (3 x 8) 30 (3 x 10)) 80 (10 x 8) 100 (10 x 10) 234
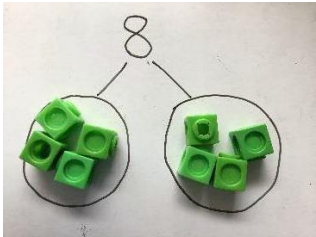
CALCULATION GUIDANCE: Multiplication

SS7/8 Multiply using the Compact method	SS7 Multiples a 4 digit number by a 2 digit number using long multiplication. SS8 Multiples multi digit numbers up to 4 digits by a 2 digit number	Children can continue to be supported by place value counters at the stage of multiplication.It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer.This moves to the more compact method.

CALCULATION   GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
SS2	Group and share objects and quantities within 10	There are …. Altogether. They are shared equally between … groups.		
SS3/4	Understanding division as Sharing / SS3 – Equal groups by sharing / SS4 -Divide by 2, 5 10	I have 8 cubes, can you share them equally between two people?	Children use pictures or shapes to share quantities. $8 \div 2 = 4$	Share 8 buns between two people. $8 \div 2 = 4$

CALCULATION GUIDANCE: Division

SS3/4	Understanding division as Sharing	SS3 – Equal groups by sharing	SS4 -Divide by 2, 5 10	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding. 	Use a number line to show jumps in groups. The number of jumps equals the number of groups. 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. $10 \div 5 = ?$ $5 \times ? = 10$	$10 \div 5 = 2$ Divide 10 into 5 groups. How many are in each group?
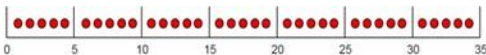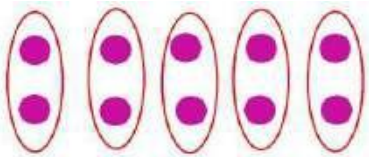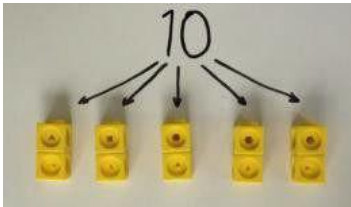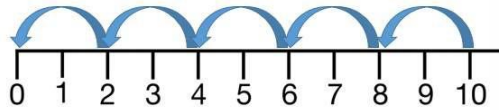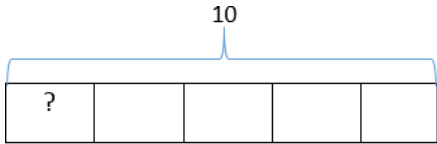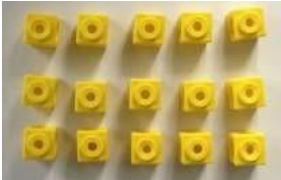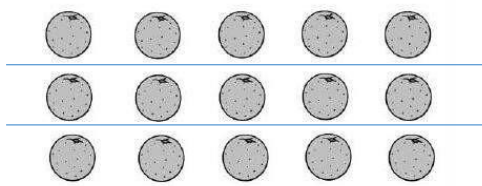
CALCULATION   GUIDANCE: Division

	Objective		Concrete	Pictorial	Abstract
SS5/6	Divide using arrays – Knowing division is the inverse of multiplication.	SS5 - Divide a 2-digit number by a 1-digit number - no exchange.	Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 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 four linking number sentences. 5 x 3 = 15 3 x 5 = 15 15 ÷ 5 = 3 15 ÷ 3 = 5

CALCULATION   GUIDANCE: Division
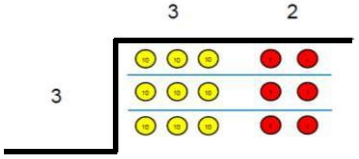
<table>
<tr>
<td>SS5/6</td>
<td>Divide using Short division method.</td>
<td>SS6 - Divides two-digit numbers by a one-digit number using formal written layout</td>
<td>

Use place value counters to divide using the short division method alongside.

$96 \div 3$

$42 \div 3$

Start with the biggest place value. We are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.

We exchange this ten for 10 ones and then share the ones equally among the groups.

We look at how many are in each group.

</td>
<td>

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.

</td>
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Begin with divisions that divide equally with no remainder.

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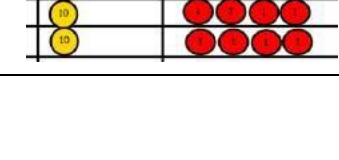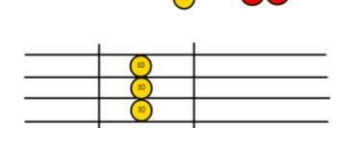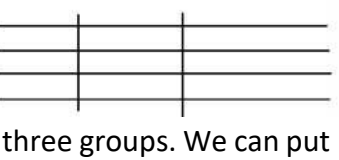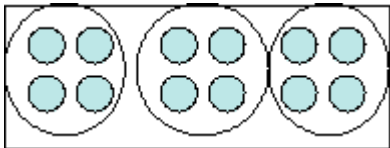
CALCULATION   GUIDANCE: Division

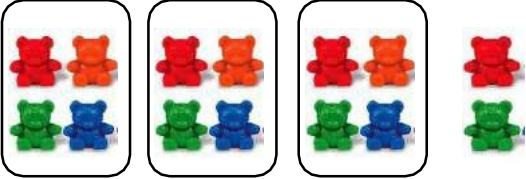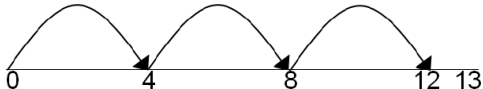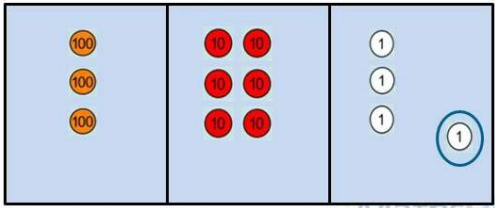|	Objective	Concrete	Pictorial	Abstract
SS5/6/7	Divide numbers with remainders — SS5 - Divide a 2-digit number by a 1-digit number - with remainders	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder. 0 4 8 12 13 Draw dots and group them to divide an amount and clearly show a remainder. remainder 2	Complete written divisions and show the remainder using r. 29 ÷ 8 = 3 REMAINDER 5 ↑ ↑ ↑ ↑ dividend divisor quotient remainder
	Short division method with remainders. — Divides a four-digit number by a one digit number using written methods, with remainders.	364 ÷ 3 = 1 2 1 rem 1 3 │ 3 6 4 100 100 100 10 10 / 10 10 / 10 10 1 1 1 (1)		Move onto divisions with a remainder. Once children understand remainders, begin to express as a fraction or decimal according to the context. 8 6 r 2 3 5 │ 4 3 2 1 8 6 1/5 5 │ 9 ^{4}3 ^{3}1 1 4 . 6 16 21 3 5 │ 5 1 1 . 0

CALCULATION   GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
SS8	Divide using Long division method.			Children will use long division to divide numbers with up to 4 digits by 2 digit numbers.

Abstract column:

$$
\begin{array}{r}
015 \\
32\,\overline{|\,487} \\
-0 \\
\overline{48} \\
-32 \\
\overline{167} \\
-160 \\
\overline{7}
\end{array}
$$

$$
\begin{array}{r}
17 \text{ r } 19 \\
31\,\overline{|\,546} \\
31\downarrow \\
\overline{236} \\
217 \\
\overline{19}
\end{array}
$$

Objective sub-columns (vertical text):
- Divides 3-digit numbers by a 2-digit number and
- Divide four digits by two digits using long division