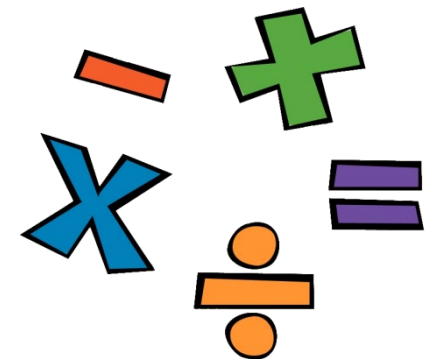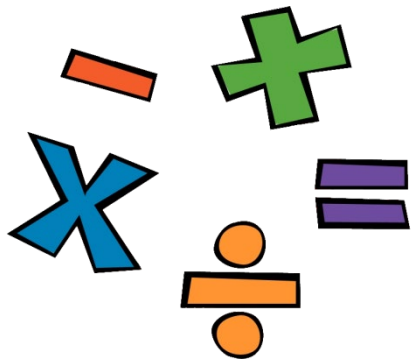# All Saints' CE Primary School

Key Stage 1 Calculation Policy
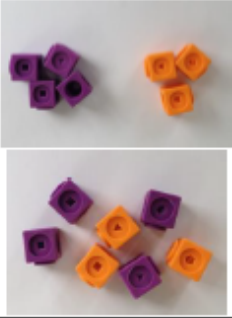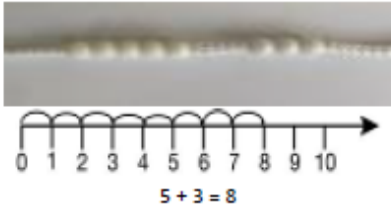
All Saints' CE Primary School Key Stage 1 Calculation Policy 2019- Based on Mathematics Mastery Progression in Calculation document
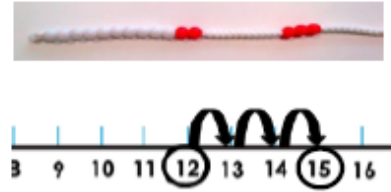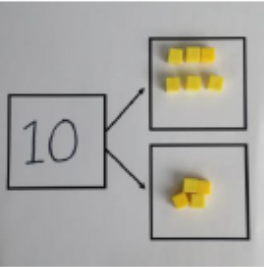
Page 1

Year 1 National Curriculum objectives linked to addition and subtraction

These objectives are explicitly covered through the strategies outlined in this document:
- Add and subtract one-digit and two-digit numbers to 20, including zero (Year 1).
- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones, a two-digit number and tens, 2 two-digit numbers; add 3 one-digit numbers (Year 2).
- Show that addition of two numbers can be done in any order (commutative) but subtraction of one number from another cannot (Year 2).
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

The following objectives should be planned for lessons where new strategies are being introduced and developed:
- Read, write and interpret mathematical statements involving addition (+), subtraction (−) and equal (=) signs.
- Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems, such as 7 = □ − 9.
- Solve problems with addition and subtraction:
- Using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- Applying their increasing knowledge of mental and written methods

Strategy & guidance	CPA
Count all *Joining two groups and then recounting all objects using one-to-one correspondence*	3 + 4 = 7 5 + 3 = 8
Counting on *As a strategy, this should be limited to adding small quantities only (1, 2 or 3) with pupils understanding that counting on from the greater number is more efficient.*	8 + 1 = 9 15 = 12 + 3 8 + 1 = 9
Part-part-whole *Teach both addition and subtraction alongside each other, as pupils will use this model to identify the inverse relationship between them.* *This model begins to develop the understanding of the commutativity of addition, as pupils become aware that the parts will make the whole in any order.*	10 6 + 4 = 10 10 = 6 + 4 10 − 6 = 4 10 − 4 = 6 10 = 4 + 6

All Saints' CE Primary School Key Stage 1 Calculation Policy 2019- Based on Mathematics Mastery Progression in Calculation document

Page 2

Year 1 Addition

Regrouping ones to make ten

(This is an essential skill that will support the make ten strategy and column addition.)

The colours of the beads on the bead string make it clear how many more need to be added to make ten.

$3 + 9 =$

$3 + 9 = 12$
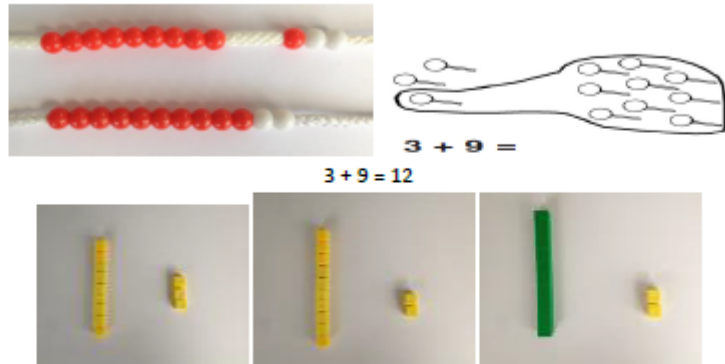
'Make ten' strategy

Pupils should be encouraged to start at the bigger number and use the smaller number to make ten.

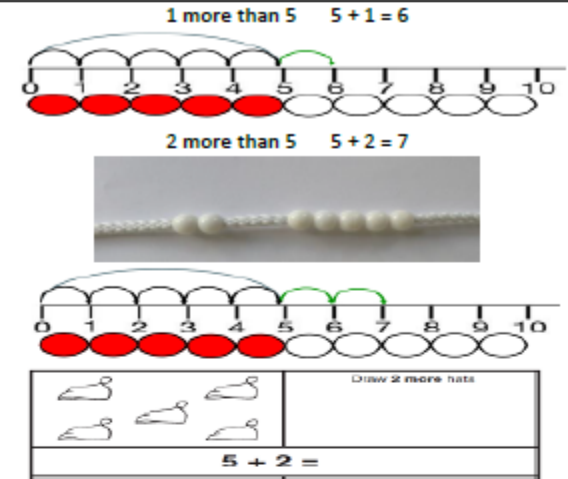The colours of the beads on the bead string make it clear how many more need to be added to make ten.

$6 + 5 = 11$

$4 + 9 = 13$
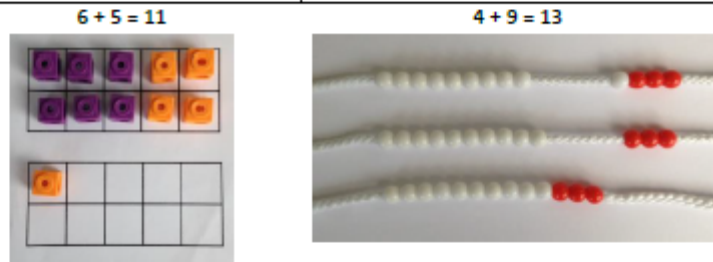
Adding 1, 2, 3 more

Here the emphasis should be on the language rather than the strategy. As pupils are using the beadstring, ensure that they are explaining using language such as;

'1 more than 5 is equal to 6.'

1 more than 5 $5 + 1 = 6$

2 more than 5 $5 + 2 = 7$
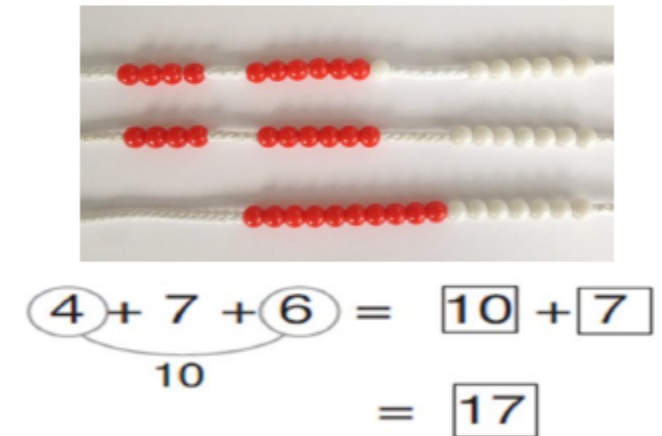
Draw 2 more hats

$5 + 2 =$

Adding three single digit numbers (make ten first)

Pupils may need to try different combinations before they find the two numbers that make 10.

The first bead string shows 4, 7 and 6. The colours of the bead string show that it makes more than ten.

The second bead string shows 4, 6 and then 7.

The final bead string shows how they have now been put together to find the total.
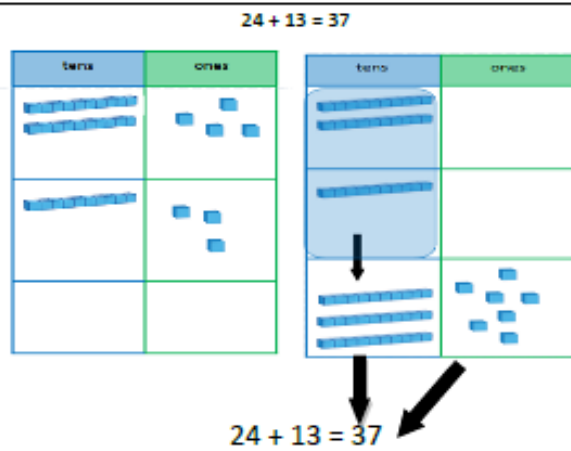
$4 + 7 + 6 = 10 + 7$

10

$= 17$

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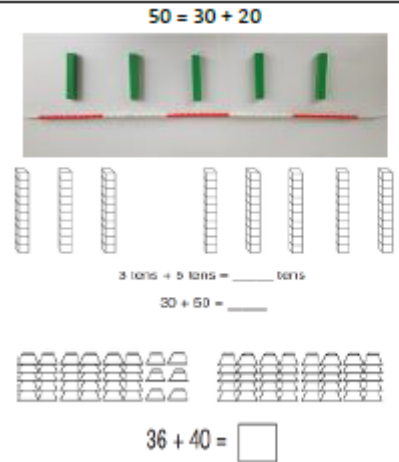
Page 3

Partitioning to add (no regrouping)

Place value grids and Dienes blocks could be used as shown in the diagram before moving onto pictorial representations. Dienes blocks should always be available, as the main focus in Year 1 is the concept of place value rather than mastering the procedure.

When not regrouping, partitioning is a mental strategy and does not need formal recording in columns. This representation prepares them for using column addition with formal recording.

$24 + 13 = 37$

$24 + 13 = 37$

Introducing column method for addition, regrouping only
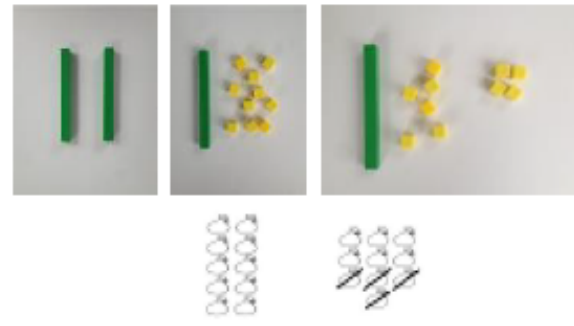
Dienes blocks and place value grids should be used as shown in the diagrams. Even when working pictorially, pupils should have access to Dienes blocks.

See additional guidance on unit pages for extra guidance on this strategy.

$24 + 17$

First add the ones.
Re-group 10 ones to 1 ten.
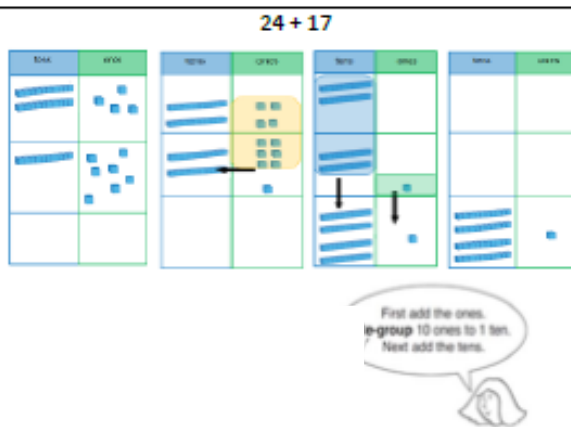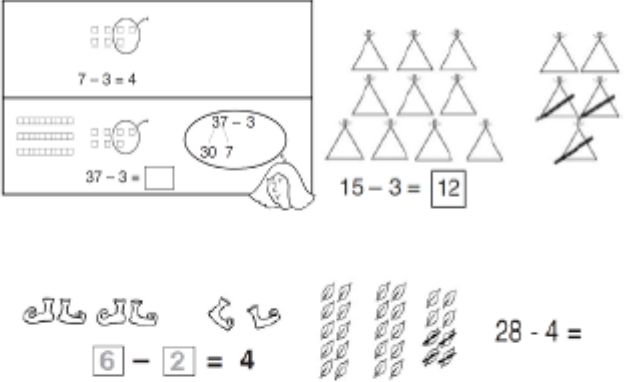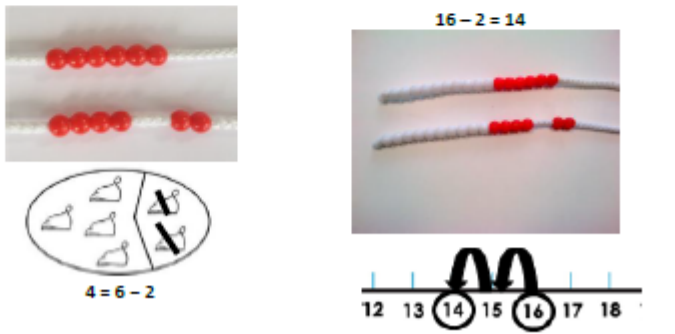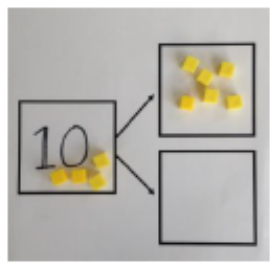Next add the tens.

Adding multiples of ten

Using the vocabulary of 1 ten, 2 tens, 3 tens etc. alongside 10, 20, 30 is important, as pupils need to understand that it is a ten and not a one that is being added.

$50 = 30 + 20$

3 tens + 5 tens = _____ tens

$30 + 50 =$ _____

$36 + 40 =$ ☐

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Page 4

Year 1 Subtraction

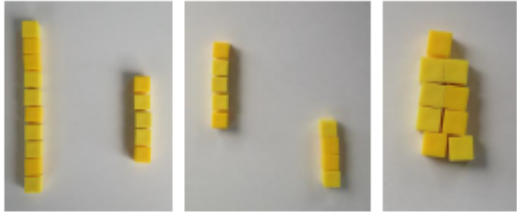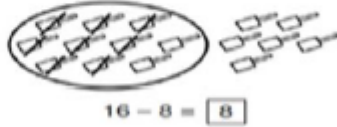| Strategy & guidance	CPA
Taking away from the ones *When this is first introduced, the concrete representation should be based upon the diagram. Real objects should be placed on top of the images as one-to-one correspondence so that pupils can take them away, progressing to representing the group of ten with a tens rod and ones with ones cubes.*	$7 - 3 = 4$ $37 - 3$ $30 \quad 7$ $37 - 3 = \square$ $15 - 3 = \boxed{12}$ $6 - 2 = 4$ $28 - 4 =$
Counting back *Subtracting 1, 2, or 3 by counting back* **Pupils should be encouraged to rely on number bonds knowledge as time goes on, rather than using counting back as their main strategy.**	$16 - 2 = 14$ $4 = 6 - 2$ 12 13 (14) 15 (16) 17 18

Part-part-whole	
Teach both addition and subtraction alongside each other, as the pupils will use this model to identify the link between them. *Pupils start with ten cubes placed on the whole.* *They then remove what is being taken away from the whole and place it on one of the parts.* *The remaining cubes are the other part and also the answer. These can be moved into the second part space.*	$10 - 6 = 4$ $4 - 1 = \square$
Regroup a ten into 10 ones *After the initial introduction, the Dienes blocks should be placed on a place value chart to support place value understanding. This will support pupils when they later use the column method.*	$20 - 4 =$

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Page 5

Year 1 Subtraction

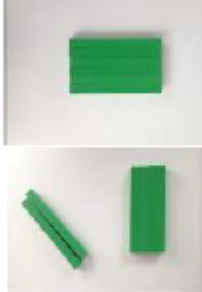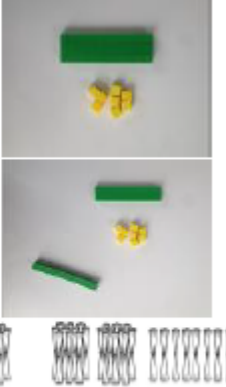|	
Taking away from the tens *Pupils should identify that they can also take away from the tens and get the same answer.* *This reinforces their knowledge of number bonds to 10 and develops their application of number bonds for mental strategies.*	9 = 15 – 6 16 – 8 = 8
Partitioning to subtract without regrouping *Dienes blocks on a place value chart (developing into using images on the chart) could be used, as when adding 2-digit numbers, reinforcing the main concept of place value for Year 1.* *When not regrouping, partitioning is a mental strategy and does not need formal recording in columns. This representation prepares them for using column subtraction with formal recording.*	34 – 13 = 21 34 – 13 = 21

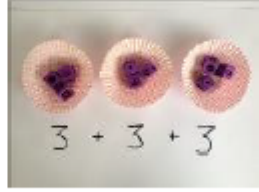|	
Subtracting multiples of ten *Using the vocabulary of 1 ten, 2 tens, 3 tens etc. alongside 10, 20, 30 is important as pupils need to understand that it is a ten not a one that is being taken away.*	40 = 60 – 20 38 – 10 = 28 6 tens – 2 tens = ____ tens 60 – 20 = ____ 38 – 10 = ☐
Column method with regrouping *This example shows how pupils should work practically when being introduced to this method.* *There is no formal recording in columns in Year 1 but this practical work will prepare pupils for formal methods in Year 2.* *See additional guidance on unit pages to support with this method.*	34 – 17 = 17

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Page 6

Year 1 National Curriculum objectives linked to multiplication and division

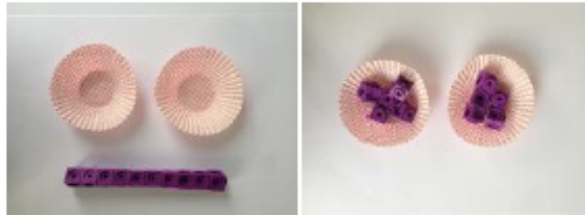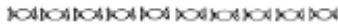## Year 1 Multiplication

Strategy & guidance	CPA
Skip counting in multiples of 2, 5, 10 from zero *The representation for the amount of groups supports pupils' understanding of the written equation. So two groups of 2 are 2, 4. Or five groups of 2 are 2, 4, 6, 8, 10.* *Count the groups as pupils are skip counting.* *Number lines can be used in the same way as the bead string.* *Pupils can use their fingers as they are skip counting.*	$4 \times 5 = 20$ $2 \times 4 = 8$
Solve multiplications using repeated addition *This strategy helps pupils make a clear link between multiplication and division as well as exemplifying the 'repeated addition' structure for multiplication. It is a natural progression from the previous 'count all' strategy as pupils can be encouraged to 'count on'. However, as number bonds knowledge grows, pupils should rely more on these important facts to calculate efficiently.*	$3 \times 3 = 3 + 3 + 3$ $3 + 3 + 3$ How many apples are there altogether? $3 + 3 + 3 = 9$

These objectives are explicitly covered through the strategies outlined in this document:

- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Year 1 Division

Strategy & guidance	CPA
Sharing objects into groups *Pupils should become familiar with division equations through working practically.* *The division symbol is not formally taught at this stage.*	$10 \div 2 = 5$ There are 10 sweets. Ring groups of 2. There are _____ groups of 2. Draw an equal number of apples for each basket. There are ___ apples in each basket.

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Page 7

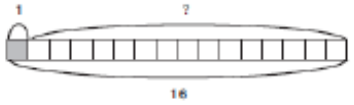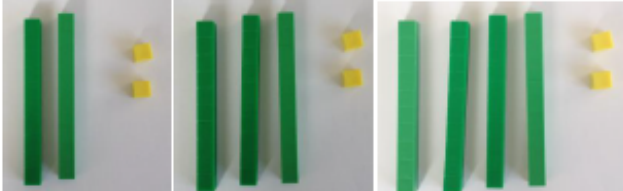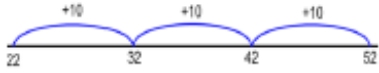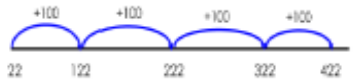# Year 2 National Curriculum objectives linked to addition and subtraction
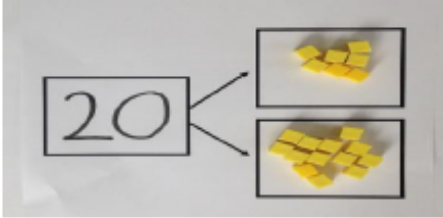
These objectives are explicitly covered through the strategies outlined in this document:

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; 2 two-digit numbers; adding three one-digit numbers.
- Add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds (Year 3).
- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Find 10 or 100 more or less than a given number (Year 3).
- Show that addition of two numbers can be done in any order (commutative) but subtraction of one number from another cannot.
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
- Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction (Year 3).
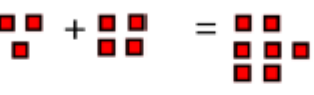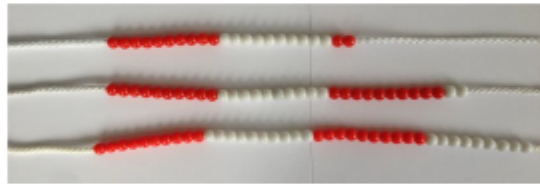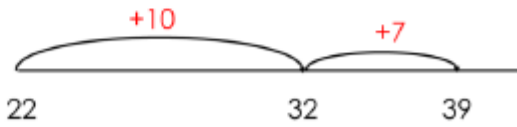
The following objectives should be planned for lessons where new strategies are being introduced and developed:

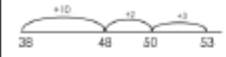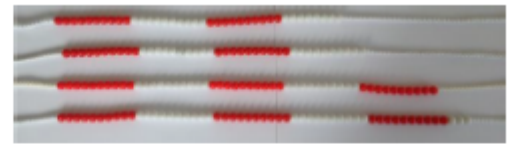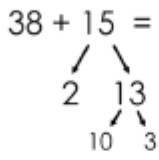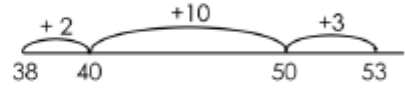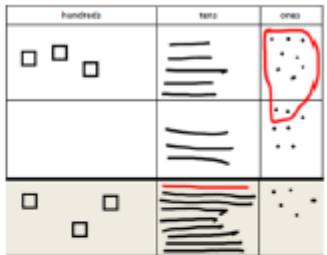- Solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures; apply increasing knowledge of mental and w ritten methods.
- Solve problems, including missing number problems, using number facts, place value and more complex addition and subtraction.
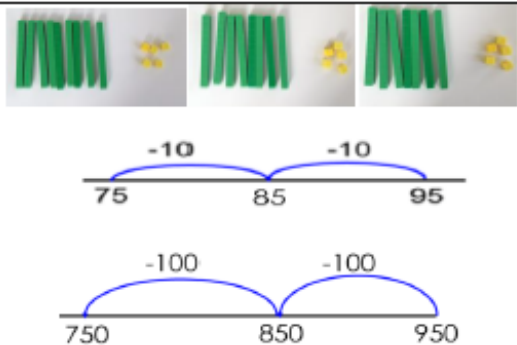
Year 2 Addition
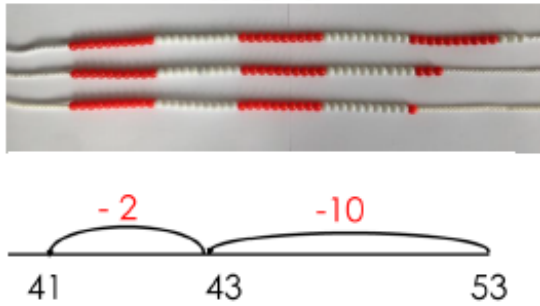
Strategy & guidance	CPA
Part-part-whole *Pupils explore the different ways of making 20. They can do this with all numbers using the same representations.* *This model develops knowledge of the inverse relationship between addition and subtraction and is used to find the answer to missing number problems.*	 $20 = 17 + 3$ $20 = 3 + 17$ $20 - 3 = 17$ $20 - 17 = 3$ $\square + \square = 20 \quad 20 - \square = \square$ $\square + \square = 20 \quad 20 - \square = \square$ $\square + 1 = 16 \quad 16 - 1 = \square$ $1 + \square = 16 \quad 16 - \square = 1$
Counting on in tens and hundreds	

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Page 8

Year 2 Addition

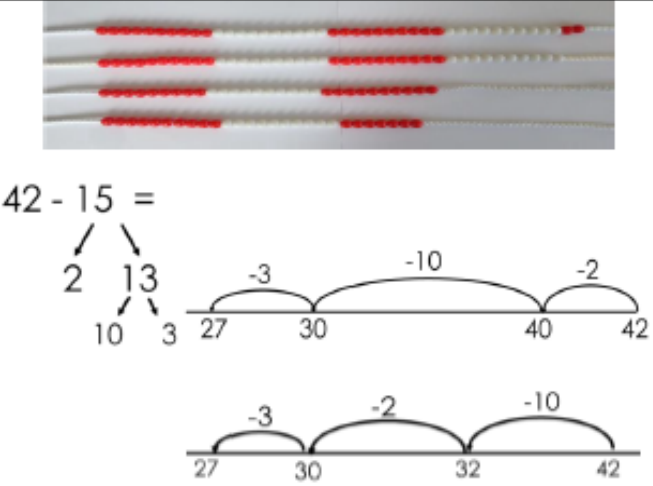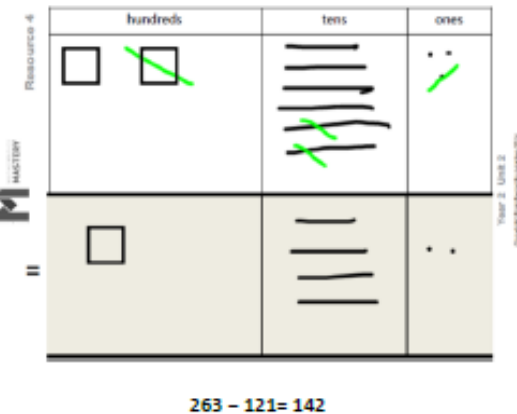| Strategy & guidance	CPA
Using known facts to create derived facts *Dienes blocks should be used alongside pictorial and abstract representations when introducing this strategy.*	$3 + 4 = 7$ *leads to* $30 + 40 = 70$ *leads to* $300 + 400 = 700$
Partitioning one number, then adding tens and ones *Pupils can choose themselves which of the numbers they wish to partition. Pupils will begin to see when this method is more efficient than adding tens and taking away the extra ones, as shown.*	+10 +7 22 32 39 $22 + 17 = 39$

Strategy & guidance	CPA
Make ten strategy *How pupils choose to apply this strategy is up to them; however, the focus should always be on efficiency.* *It relies on an understanding that numbers can be partitioned in different ways in order to easily make a multiple of ten.*	$38 + 15 =$ 2 13 10 3 +2 +10 +3 38 40 50 53
Partitioning to add without regrouping *As in Year 1, this is a mental strategy rather than a formal written method. Pupils use the Dienes blocks (and later, images) to represent 3-digit numbers but do not record a formal written method if there is no regrouping.*	$455 + 103 = 558$
Column method with regrouping *Dienes blocks should be used alongside the pictorial representations; they can be placed on the place value grid before pupils make pictorial representations.* *As in Year 1, the focus for the column method is to develop a strong understanding of place value.*	<table><tr><th>hundreds</th><th>tens</th><th>ones</th></tr><tr><td>3</td><td>5</td><td>8</td></tr><tr><td></td><td>3</td><td>7</td></tr><tr><td>3</td><td>9</td><td>5</td></tr></table>

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Page 9

Year 2 Subtraction

Strategy & guidance	CPA
Counting back in multiples of ten and one hundred	
Using known number facts to create derived facts *Dienes blocks should be used alongside pictorial and abstract representations when introducing this strategy, encouraging pupils to apply their knowledge of number bonds to add multiples of ten and 100.*	$8 - 4 = 4$ *leads to* $80 - 40 = 40$ *leads to* $800 - 400 = 400$
Subtracting tens and ones *Pupils must be taught to partition the second number for this strategy as partitioning both numbers can lead to errors if regrouping is required.*	$53 - 12 = 41$

Strategy & guidance	CPA
Make ten *How pupils choose to apply this strategy is up to them. The focus should always be on efficiency.* *It relies on an understanding that numbers can be partitioned in different ways in order to subtract to a multiple of ten.* *Pupils should develop an understanding that the parts can be added in any order.*	$42 - 15 =$
Partitioning to subtract without regrouping *As in Year 1, the focus is to develop a strong understanding of place value and pupils should always be using concrete manipulatives alongside the pictorial.* *Formal recording in columns is unnecessary for this mental strategy. It prepares them to subtract with 3-digits when regrouping is required.*	 $263 - 121 = 142$

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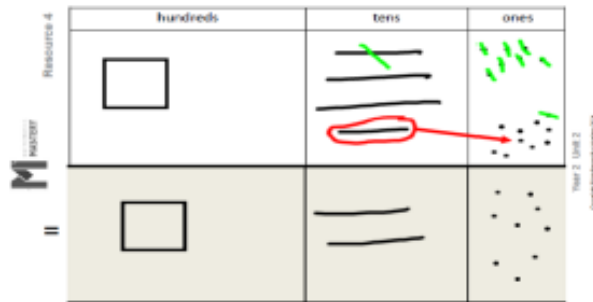Page 10

Column method with regrouping

The focus for the column method is to develop a strong understanding of place value and concrete manipulatives should be used alongside.

Pupils are introduced to calculations that require two instances of regrouping (initially from tens to one and then from hundreds to tens). E.g. 232 – 157 and are given plenty of practice using concrete manipulatives and images alongside their formal written methods, ensuring that important steps are not missed in the recording.

Caution should be exercised when introducing calculations requiring 'regrouping to regroup' (e.g. 204 – 137) ensuring ample teacher modelling using concrete manipulatives and images.

hundreds tens ones

$$1\ {}^3\!4\ {}^17$$
$$-\quad 1\ 8$$
$$\overline{1\ 2\ 9}$$

hundreds	tens	ones

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Year 2 National Curriculum objectives linked to multiplication and division
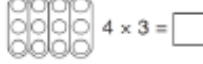
Year 2 Multiplication
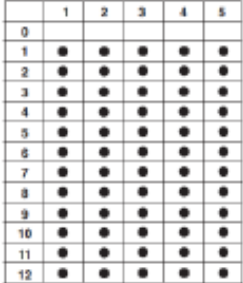
These objectives are explicitly covered through the strategies outlined in this document:

- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- Recall and use multiplication and division facts for the 3 and 4 multiplication tables (Year 3).
- Show that multiplication of two numbers can be done in any order (commutative) but division of one number by another cannot.

The following objectives should be planned for lessons where new strategies are being introduced and developed:

- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equal (=) signs.
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods and multiplication and division facts, including problems in context.
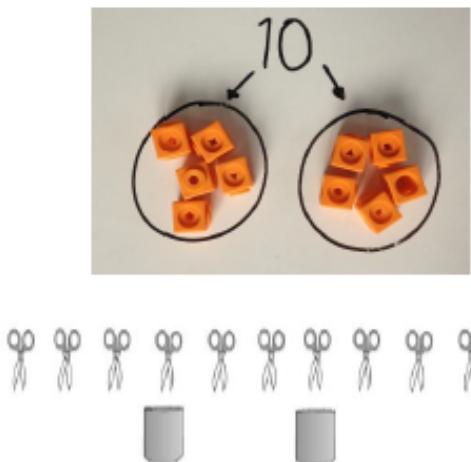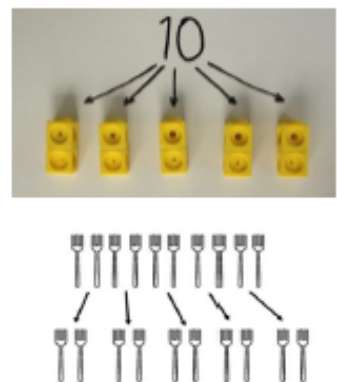
Strategy & guidance	CPA
Skip counting in multiples of 2, 3, 4, 5, 10 from zero *Pupils can use their fingers as they are skip counting, to develop an understanding of 'groups of'.* *Dot arrays can be used to create a visual representation for the different multiplication facts. Bead strings, groups of cubes (or unifix / multilink towers) provide useful concrete representations.*	
Multiplication as repeated addition *Pupils apply skip counting to help find the totals of repeated additions.*	$5+5+5+5+5+5+5+5 = \square$ $4 \times 3 = \square$

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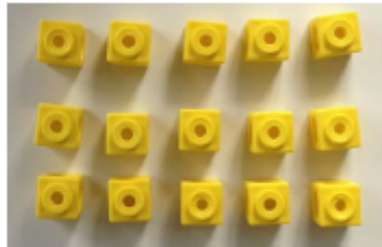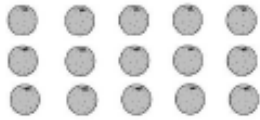| Strategy & guidance	CPA
Arrays to represent multiplication equations *Concrete manipulatives and images of familiar objects begin to be organised into arrays and, later, are shown alongside dot arrays. It is important to discuss with pupils how arrays can be useful.* *Pupils begin to understand multiplication in a more abstract fashion, applying their skip counting skills to identify the multiples of the 2x, 5x and 10x tables.* *The relationship between multiplication and division also begins to be demonstrated.*	
Multiplication is commutative *Pupils should understand that an array and, later, bar models can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.*	 $3 \times 5 =$ ☐ $5 \times 3 =$ ☐ $12 = 3 \times 4$ $12 = 4 \times 3$

Strategy & guidance	CPA
Use of part-part-whole model to establish the inverse relationship between multiplication and division *This link should be made explicit from early on, using the language of the part-part-whole model, so that pupils develop an early understanding of the relationship between multiplication and division. Bar models (with Cuisenaire rods) should be used to identify the whole, the value of the parts and the number of parts.* *It is important to highlight that with multiplication, the parts are of equal value as this is different to how this model is used for addition and subtraction*	There are three equal parts. Each part has a value of three. What is the whole? $3 \times 3 =$ ☐ $9 \div 3 =$ ☐ What multiplication and division equations can you write for each bar model? Prove that the equations are correct using a bead string.
Doubling to derive new multiplication facts *Pupils learn that known facts from easier multiplication tables can be used to derive facts from related times tables using doubling as a strategy.* *At this stage they double the 2× table facts to derive the 4× table facts.*	 $5 \times 2 = 10$ $5 \times 4 = 20$

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Year 2 Division

Strategy & guidance	CPA	Strategy & guidance	CPA
Division as sharing *Here, division is shown as sharing.* *If we have ten pairs of scissors and we share them between two pots, there will be 5 pairs of scissors in each pot.*	$10 \div 2 = 5$ 	**Use of part-part-whole model to represent division equations and to emphasise the relationship between division and multiplication** *Pupils use arrays of concrete manipulatives and images of familiar objects to solve division equations.* *They begin to use dot arrays to develop a more abstract concept of division.* *It is important to highlight that with multiplication and division, the parts are of equal value as this is different to how this model is used for addition and subtraction.*	 $15 \div 5 = \boxed{3}$ $15 \div 3 = \boxed{5}$ Write the division equations that the array represents.. $20 \div 4 = \square$ $20 \div 5 = \square$ The whole is nine. There are three equal parts. What is the value of each part? $9 \div 3 = \square$
Division as grouping *Here, division is shown as grouping.* *If we have ten forks and we put them into groups of two, there are 5 groups.*	$10 \div 2 = 5$ 		

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