

Barcombe Hamsey Plumpton Skylark Federation

Calculations Policy

Reviewed and approved by FGB: 06.02.20 Review: Spring 2023

Signed	Chair of Governors	Date
Signed	Executive Headteache	er Date

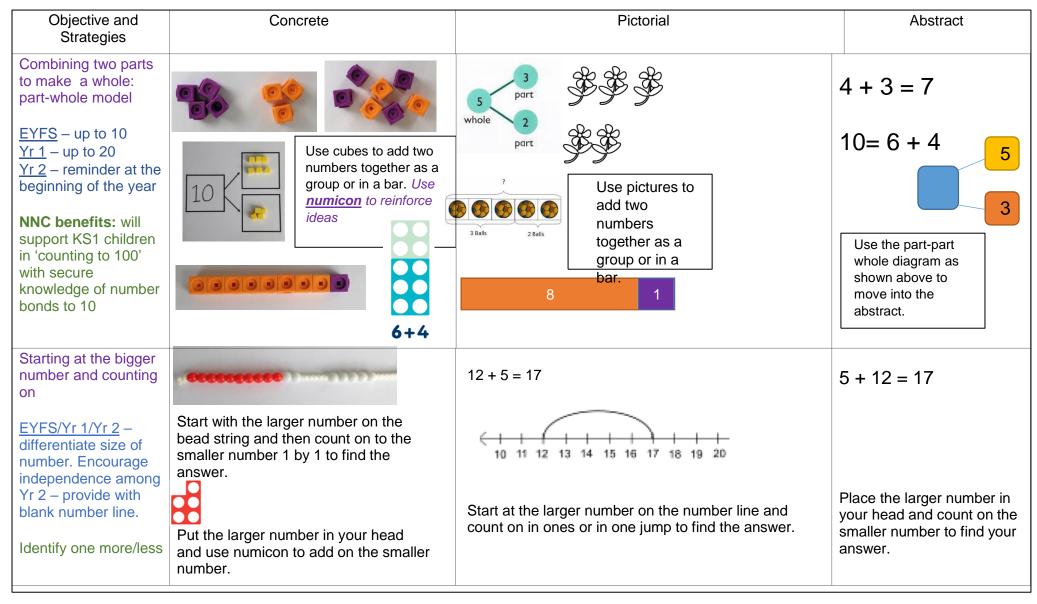
Progression in Calculations







Addition



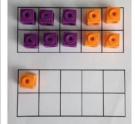
Regrouping to make 10.

Yr 1/Yr 2 – differentiate numbers accordingly.

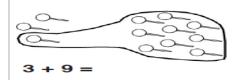
Support children in using language such as: equal to, more than, less than, most, least.



6 + 5 = 11



Start with the bigger number and use the smaller number to make 10.



Use pictures or a number line. Regroup or partition the smaller number to make 10.

If I am at seven, how many more do I need to make 10. How many more do I add on now?

Adding three single digits

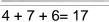
Yr 2 – adding 3 one digit numbers together → leading to two-digit number and ones

Adding 3 one digit numbers together → leading to twodigit number and ones

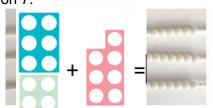
Column methodno regrouping

Yr 2 – supports commutativity. Adding two two-digit numbers.

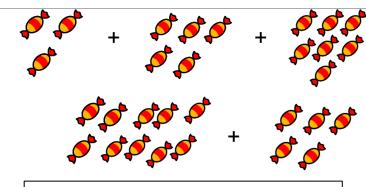
Yr 3 – 2x 3 digit numbers.



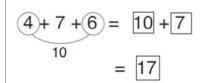
Put 4 and 6 together to make 10. Add on 7.



Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.



Add together three groups of objects. Draw a picture to recombine the groups to make 10.



Combine the two numbers that make 10 and then add on the remainder.

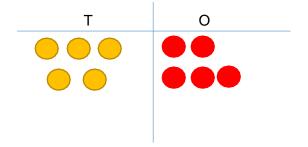
24 + 15=

Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.

т	0

30	•
00 00 00	0000
10	0000

After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.



Calculations

21

+ 42

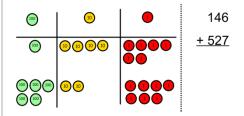
Column methodregrouping

Yr 3 – supports children's understanding of place value → 10 tens = 1 100.

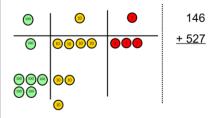
Yr 4 – as above with 4 digit numbers.

Year 5/6 – contraction method (see abstract) for whole and decimal numbers.

Make both numbers on a place value grid.



Add up the units and exchange 10 ones for one 10.

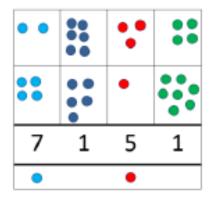


Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.

This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.

As children move on to decimals, money and decimal place value counters can be used to support learning.

Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.



Start by partitioning the numbers before moving on to clearly show the exchange below the addition.

$$\begin{array}{rrrr} 20 & + & 5 \\ \underline{40} & + & 8 \\ 60 & + & 13 \end{array} = 73$$

As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here. $\frac{+85}{621}$

536

Subtraction

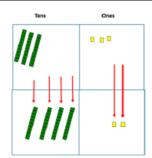
Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones EYFS – up to 10 Yr 1 – up to 20 Represent and use number bonds and related subtraction facts within 20. Add and subtract one-digit and two-digit numbers to 20, including zero.		Cross out drawn objects to show what has been taken away.	18 -3= 15 8 - 2 = 6
Counting back EYFS – up to 10 Yr 1 – up to 20 Yr 2 – up to 100 Recall and use addition and subtraction facts to 20	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.	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.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.
fluently, and derive and use related facts up to 100	Use counters and move them away from the group as you take them away counting backwards as you go.	This can progress all the way to counting back using two 2 digit numbers.	

Find the	Compare amounts and objects to find		Hannah has 23 sandwiches,
difference	the difference.	+6 Count on to	Helen has 15 sandwiches.
		find the	Find the difference between
<u>Yr 1</u> – up to 20		difference.	the number of sandwiches.
<u>Yr 2</u> – up to	Use cubes to	0 1 2 2 4 5 6 7 8 0 10 11 12	
100	build towers or	0 1 2 3 4 3 6 7 8 9 10 11 12	
100	make bars to		
	find the	Comparison Bar Models	
	difference	Companson bar models	
	5 Pencils	Draw bars to Lisa is 13 years old. Her sister is 22 years old.	
	Use basic bar	find Find the difference in age between them.	
	models with	the difference 13 ?	
	items to find	between 2	
	the difference	numbers.	
	3 Erasers ?	oisi ci	
		22	
Part Part Whole	Link to addition- use	Use a pictorial representation of objects to show the part	
Model	the part whole model	part whole model.	5
	to help explain the		
<u>Yr 1</u> – up to 20	inverse between		10
<u>Yr 2</u> – up to 100	addition and		
	subtraction.		
	If 40 is the whole and C is one of the		May a to using a pumbara
	If 10 is the whole and 6 is one of the parts. What is the other part?		Move to using numbers within the part whole model.
	parts. What is the other part?		within the part whole model.
	10 - 6 =		
Make 10	14 – 9 =		
WIGHTO TO		40 7 6	16 – 8=
<u>Yr 1</u> – up to 20		13 - 7 = 6 -4 -3	
<u>Yr 2</u> – up to 100,		[3] [4]	How many do we take off to
relating to		0 1 2 3 4 5 (6) 7 8 9 (10) 11 12 (13) 14 15 16 17 18 19 20	reach the next 10?
understanding of 10		Start at 13. Take away 3 to reach 10. Then take away the	
5	Make 14 on the ten frame. Take away	remaining 4 so you have taken away 7 altogether. You	How many do we have left
	the four first to make 10 and then	have reached your answer.	to take off?
	takeaway one more so you have taken		
	away 5. You are left with the answer of		
	9.		

Column method without regrouping

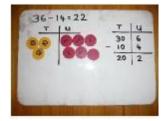
<u>Yr 2</u> –Subtracting two two-digit numbers.

Yr 3 – 2x 3 digit numbers

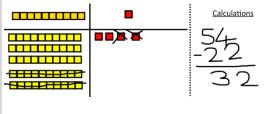


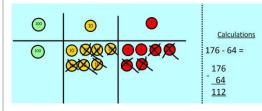
Show how you partition numbers to subtract.

Again make the larger number first.

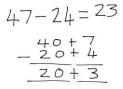


Use Base 10 to make the bigger number then take the smaller number away.





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.



Column method with regrouping

Yr 3 – supports children's understanding of place value → 10 tens = 1 100.

Yr 4 – as above with 4 digit numbers.

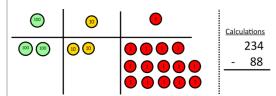
Year 5/6 –
contraction
method (see
abstract) for
whole and
decimal numbers

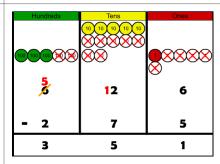
Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

Make the larger number with the place value counters

100	10	•	<u>Calculations</u>
100 100	10 10 10		234 - 88

Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.





When confident, children can find their own way to record the exchange/regrouping.

Draw the counters onto

taken away by crossing

the counters out as well as clearly showing the

exchanges you make.

a place value grid and

show what you have

Just writing the numbers as shown here shows that the child understands the method

and knows when to exchange/regroup.

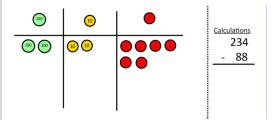


Children can start their formal written method by partitioning the number into clear place value columns.

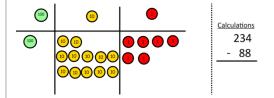


Moving forward the children use a more compact method.

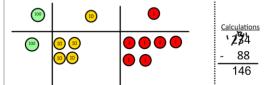
Now I can subtract my ones.



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



Now I can take away eight 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. This will lead to an understanding of subtracting any number including decimals.

Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
Doubling EYFS/Yr 1 – make connections between arrays, number patterns, counting in twos, fives and tens. Yr 2 – abstract – supports conception of commutativity	Use practical activities to show how to double a number. double 4 is 8 $4 \times 2 = 8$	Draw pictures to show how to double a number. Double 4 is 8	16 10 6 1x2 20 12 Partition a number and then double each part before recombining it back together.
Counting in multiples EYFS – see concrete Yr 1 – grouping and combining groups using concrete apparatus Yr 2 – count on in 2, 5	Count in multiples supported by concrete objects in equal groups.	Use a number line or pictures to continue support in 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

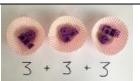
Repeated addition
Yr 1 – supports in adding 3 1 digit numbers

Yr 2 recognise inverse relationship e.g. $5 \times 4 = 20$. 20 shared by 4 = 5.

Arrays-showing commutative multiplication

Yr 2 – understand commutativity → develop multiplicative reasoning.

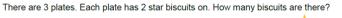
Work with a range of materials and contexts in which multiplication and division relate to grouping & sharing







Use different objects to add equal groups.







2 add 2 add 2 equals 6



5 + 5 + 5 = 15

Write addition sentences to describe objects and pictures.



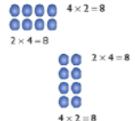
Create arrays using counters/ cubes to show multiplication sentences.





Draw arrays in different rotations to find **commutative** multiplication sentences.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15





Link arrays to area of rectangles.

Use an array to write multiplication sentences and reinforce repeated addition.



$$5 + 5 + 5 = 15$$

$$3 + 3 + 3 + 3 + 3 = 15$$

$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

Grid Method

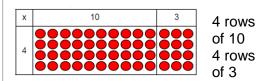
Yr 3 – reinforces place value of each number in a 3 digit number.

Call it P-M-C → partition, multiply, combine.

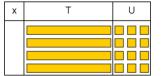
Yr 4 – begin with this method to reinforce place value understanding. Move onto contraction method towards end of Yr 4.

Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit by one-digit numbers progressing to the formal written methods for...multiplication.

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

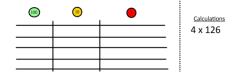


Move on to using Base 10 to move towards a more compact method.

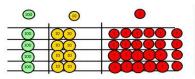


4 rows of 13

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.

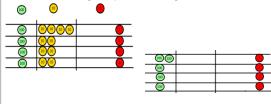


Fill each row with 126.



4 x 126

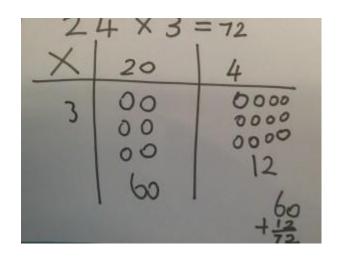
Add up each column, starting with the ones making any exchanges needed.



Then you have your answer.

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.

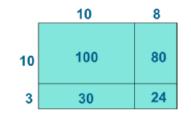


Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

×	30	5
7	210	35

$$210 + 35 = 245$$

Moving forward, multiply by a 2 digit number showing the different rows within the grid method.



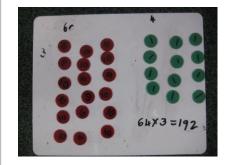
Х	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

Column multiplication

Yr 4 – introduce at the end with 'number sentence' or 'number sum' in brackets next to the column.

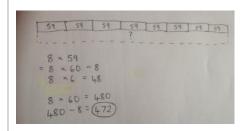
Yr 5/6 – compact long multiplication method, following concrete reminder in T1/2 of academic year (see concrete column).

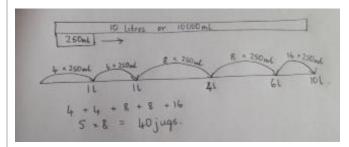
Children can continue to be supported by place value counters at the stage of multiplication.



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.

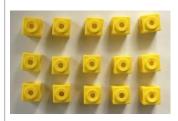
This moves to the more compact method.

Division

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups EYFS – see concrete		Children use pictures or shapes to share quantities.	Share 9 buns between three people. $9 \div 3 = 3$
Yr 1 – grouping and combining groups using concrete apparatus Yr 2 – reminder at the	I have 10 cubes, can you share them equally in 2	$8 \div 2 = 4$	
beginning of Yr2 Division as	groups?		
grouping	Divide quantities into equal groups. Use cubes, counters, objects or place	Use a number line to show jumps in groups. The number of jumps equals the number of groups.	28 ÷ 7 = 4
EYFS – see concrete. See ELG objectives. Yr 1 – begin with	value counters to aid understanding.	0 1 2 3 4 5 6 7 8 9 10 11 12	Divide 28 into 7 groups. How many are in each group?
concrete. Singapore introduces understanding of reversibility.	0 5 10 15 20 25 30 35	3 3 3 3 3 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.	
Yr 2 – Singapore bar method to reinforce concept of commutativity.	96 ÷ 3 = 32	20	
	***	20 ÷ 5 = ? 5 x ? = 20	

Division within arrays

Yr 1/2 – develop multiplicative reasoning using commutativity and inverse relationships.



Link division multiplication by creating an array and thinking about the

number sentences that can be created.

Eg
$$15 \div 3 = 5$$
 $5 \times 3 = 15$
 $15 \div 5 = 3$ $3 \times 5 = 15$

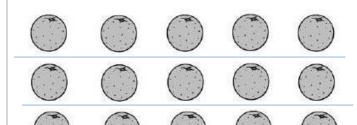


Yr 2/3 – Concrete and pictorial used in Yr 2 to elicit understanding of problems in context. Year 3 made aware of mathematical vocabulary in abstract column.



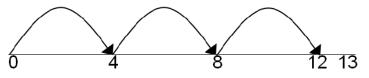
Divide objects between groups and see how much is left over





Draw an array and use lines to split the array into groups to make multiplication and division sentences.

Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.



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









Find the inverse of multiplication and division sentences by creating four linking number sentences.

$$7 \times 4 = 28$$

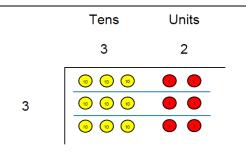
 $4 \times 7 = 28$
 $28 \div 7 = 4$
 $28 \div 4 = 7$

Complete written divisions and show the remainder using r.

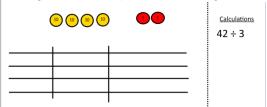
$$29 \div 8 = 3$$
 REMAINDER 5 \uparrow \uparrow thirdend divisor quotient remainder

Short division

Yr 3/4 – pupils practise to become fluent in the formal written method for short multiplication and short division with exact answers.

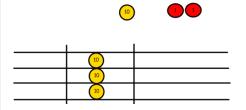


Use place value counters to divide using the bus stop method alongside

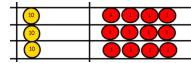


42 ÷ 3=

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.

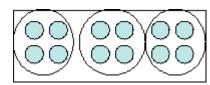


We exchange this ten for ten ones and then share the ones equally among the groups.



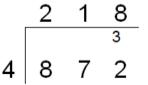
We look how much in 1 group so the answer is 14.

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.

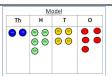


Move onto divisions with a remainder.

Finally move into decimal places to divide the total accurately.

Long division

Yr 5/6 – divide numbers to 4 digits by a 2 digit whole number using formal written written method for long division. Begin with concrete to support reinforcement of place value.



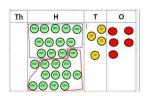
2544 ÷ 12 How many groups of 12 thousands do we have? None

Exchange 2 thousand for 20 hundreds.



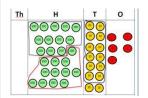
$$12 \overline{)2544}$$

How many groups of 12 are in 25 hundreds? 2 groups. Circle them. We have grouped 24 hundreds so can take them off and we are left with one.



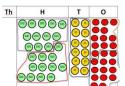
$$\begin{array}{r}
 02 \\
 \hline
 12 2544 \\
 \underline{24} \\
 1
 \end{array}$$

Exchange the one hundred for ten tens so now we have 14 tens. How many groups of 12 are in 14? 1 remainder 2



$$\begin{array}{r}
0 2 1 \\
12 2544 \\
\underline{24} \\
14 \\
\underline{12} \\
2
\end{array}$$

Exchange the two tens for twenty ones so now we have 24 ones. How many groups of 12 are in 24? 2



$$\begin{array}{r}
 \begin{array}{r}
 0 \ 2 \ 1 \ 2 \\
 \hline
 12 \overline{\smash{\big)}2544} \\
 \underline{24} \\
 \underline{14} \\
 \underline{12} \\
 \underline{24} \\
 \underline{24} \\
 \underline{0}
 \end{array}$$

Instead of using physical counters, students can draw the counters and circle the groups on a whiteboard or in their books.

Use this method to explain what is happening and as soon as they have understood what move on to the abstract method as this can be a time consuming process.

