

BONNEVILLE



PRIMARY SCHOOL

*Success for today, prepared for tomorrow*

# Calculations Policy

2016

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# Introduction

The Calculations Policy has been put together in consultation with the staff at Bonneville Primary School to ensure that there is a consistent approach to the teaching of calculation throughout the school. All staff should refer to the policy in order to provide continuity and development in written calculations as children progress through the school.

This policy brings together our ideas and practice in striving to provide our children with every opportunity to achieve in mathematics. It has been updated to reflect the changes to the National Curriculum in 2014. It is in line with the framework of objectives for each year group.

## **Aims:**

- To raise attainment and increase pupil progress
- To have a consistent approach to the teaching of calculations throughout the school
- To ensure progression between classes and across the Key Stages
- To provide all teaching and support staff with a framework for the teaching of calculation strategies

## **How to use this policy:**

- Use the policy as the basis of your planning but ensure you use previous or following years' guidance to allow for personalised learning
- Always use Assessment for Learning to identify suitable next steps in calculation for groups of children
- If, at any time, children are making significant errors, return to the previous stage in calculation
- Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate
- Encourage children to make sensible choices about the methods they use when solving problems

# Written calculation strategies: Nursery

## ADDITION

Underpinning mental and oral skills, knowledge and understanding.

- 1 Concrete addition in role play.
- 2 Adding one more.
- 3 Washing line to 10/20
- 4 Adding using fingers.
- 5 Number songs and rhymes.
- 6 Stories relating to number facts, etc.
- 7 Label sets.
- 8 Sorting and classification.
- 9 Ordering.
- 10 Tally charts.
- 11 Number games.

Opportunities given for child to choose themselves

## SUBTRACTION

Underpinning mental and oral skills, knowledge and understanding.

- 1 Concrete subtraction in role play.
- 2 Activities involving one less.
- 3 Hiding objects.
- 4 Using fingers.
- 5 Using fingers to calculate one less.
- 6 Songs etc. as in addition.

# Written calculation strategies: Reception

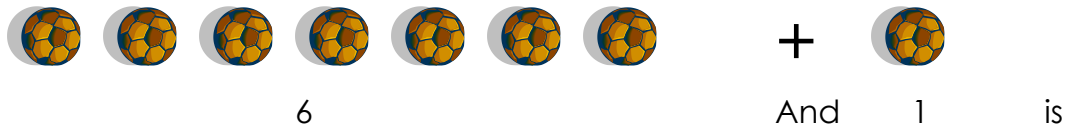
## ADDITION

Underpinning mental and oral skills, knowledge and understanding.

- 1 Washing line to 20. Saying and using number games.
- 2 Missing numbers.
- 3 Number grid to 10 and 100.
- 4 Practical activities in role play.
- 5 Number songs and rhymes.
- 6 Number stories.
- 7 Sorting and ordering.

## Written recording and calculation strategies.

1. Recording additions using both pictures and objects, one more



Moving from concrete materials and pictures to written calculations

- □□ and □□□ is □□□□□
- 2 and 3 is 5
- 2+3=5

2. Empty box problems. How many more?



(Use numerals as appropriate and vocabulary: Add, equals, more than, altogether, plus and greater.)

3. Relate to combining two groups and practical problem solving.
4. Writing numbers. Number formation.
5. Games and stories, etc.

## **SUBTRACTION**

Underpinning mental and oral skills, knowledge and understanding.

- 1 Washing line to 20. Saying and using number names.
- 2 Missing numbers.
- 3 Number grid to 10 and 100.
- 4 Dice and other games.
- 5 Practical activities in role play.

### **Written recording calculation strategies**

- 1 Recording subtractions using both pictures and objects – one less.

take away  is

4 take away 1 is =

$4 - 1 =$

- 2 Empty box problems. How many less?
- 3 (using numerals as appropriate and vocabulary less than, take away. Subtract, how many left, difference between.)

take away  =

4 take away  is 2

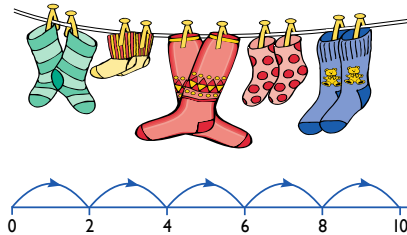
$4 - \square = 2$

Pictures to match practical situation, subtraction is "taking away"

# MULTIPLICATION

Underpinning mental and oral skills, knowledge and understanding.

- 1 Role play repeated addition.



$2 + 2 + 2 + 2 + 2 = 10$   
 $2 \times 5 = 10$   
2 multiplied by 5  
5 pairs  
5 hops of 2

- 2 Counting in 2's .
- 3 Pairing socks, shoes, etc.
- 4 Doubling numbers.
- 5 Lining up.

## Written recording and calculation strategies

- 6 Using number line to count in 2's



- 7 Recording doubling using objects and pictures.



- 8 Songs, books, stories, etc.
- 9 Use hundred squares and number lines to practise counting

## **DIVISION**

Underpinning mental and oral skills, knowledge and understanding.

- 1 Practical sharing activities e.g., sweets and fruit.
- 2 How many each?
- 3 Grouping for PE, etc.
- 4 Introduce arrays as a form of recording.



# Written calculation strategies: Year 1

## ADDITION

Underpinning mental and oral skills, knowledge and understanding.

- 1 Washing line to 30. Saying and using number names. Missing numbers.
- 2 Number grid to 100
- 3 Read and write numerals to 20 (and beyond) in numbers and words.
- 4 Count, read and write numbers to 100 in numerals
- 5 Show and use subtraction facts within 20
- 6 Represent and use number bonds to 20
- 7 Doubles of numbers to 10.
- 8 Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- 9 Use a range of mathematical vocabulary including: equal to, more than, most,
- 10 Adding 1 and 2 digit numbers to 20, including 0

### Method:

Put number in head and count on.

Putting larger number first.

Reinforce learning with equipment.

### Written recording and calculation strategies

1. Empty box pictorially.

$$\square \square \square \square + \square \square = \square$$

$$\square \square + \square = \square \square \square \square \square \square$$

2. Empty box with numerals

$$4 + \square \text{ is } 7$$

$$3p + \square + 1p = 8p$$

3. Adding three numerals e.g.

$$3+4+2=\square$$

4. Using a completed number line or track to count on.



$$4 + 2 = 6$$

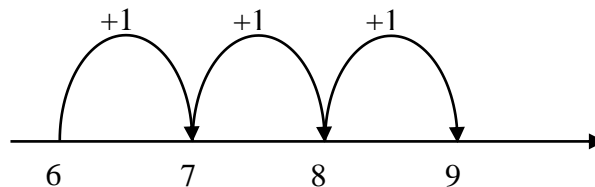
5. Progress to using a marked number line

**0 1 2 3 4 5 6 7 8 9 10**

$$4 + 3 = 7$$

6. Once children are confident with using a marked number line, introduce an empty number line to count on.

$$6 + 3 =$$



Mental strategies to solve simple problems in addition and encourage children's own recording using conventional signs.

3 Problem solving games.

4 Number rhymes and songs

## SUBTRACTION

Underpinning mental and oral skills, knowledge and understanding.

1. Washing line to 30. Saying and using number names. Missing numbers.



2. Number grid to 100
3. Counting back from any number up to 100
4. Compare less than (fewer)
5. Inverse of number bonds to 20, e.g.  $10-3=$
6. Use a range of mathematical vocabulary including: less than (fewer), least, take away, difference.

### Method:

Put number in head and count back.

Count back from the largest number.

Count up from given number.

### Written recording and calculation strategies

1. How many less (fewer) for small differences?

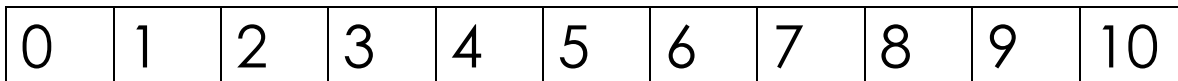


2. Empty box pictorially.
3. Empty box with numerals

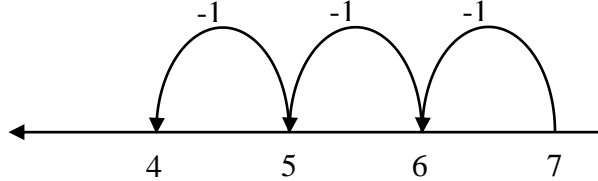
$$10 - \square = 7$$

4. Use an empty number line or track to count back.

$$7 - 3 = 4$$



5. Progress to a marked number line and then to an empty number line



4 Mental strategies to solve simple problems in subtraction. Encourage children's own recording using conventional signs.

## MULTIPLICATION

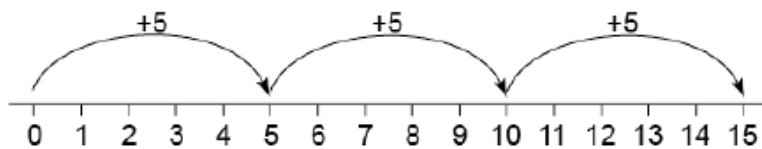
Underpinning mental and oral skills, knowledge and understanding.

- 1 Recognise odd and even numbers.
- 2 Doubles of single digit numbers
- 3 Repeated addition
- 4 Counting in 2s, 5s and 10s to the tenth multiple
- 5 Use arrays to multiply

## Written recording and calculation strategies

1. Multiplication as repeated addition

$$5 \times 3$$

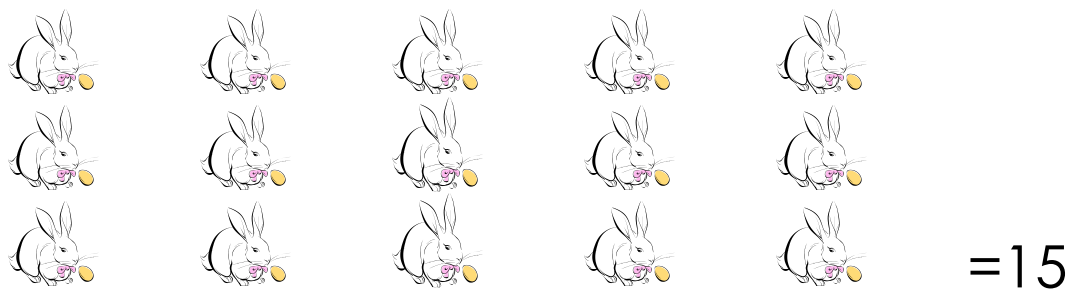


$$5 + 5 + 5 = 15$$

$$5 \times 3 = 15$$

2. Arrays as a form of recording

5 groups of 3      or      3 groups of 5



$$5 \times 3 = 15$$

### **DIVISION**

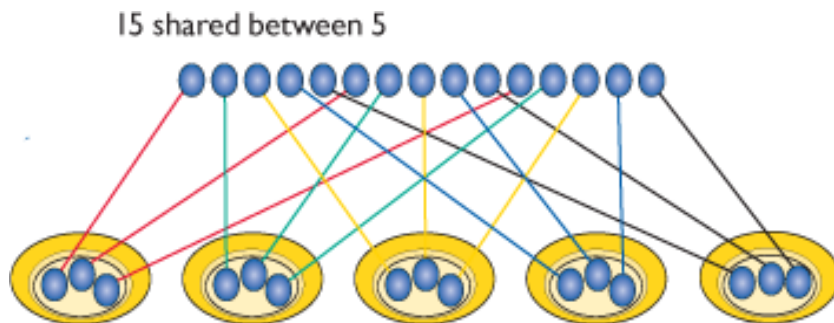
Underpinning mental and oral skills, knowledge and understanding.

1. Halves of numbers to 10
2. Repeated subtraction
3. Counting back in 2s, 5s and 10s
4. Share and group small amounts using concrete objects

### **Written recording and calculation strategies**

1. Division as sharing and grouping  
How many groups of 5 are there in 15?  
What is 15 shared between 5 people?

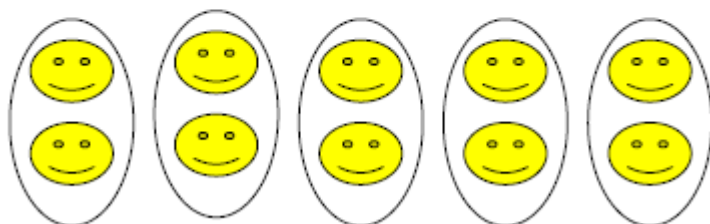
Practical activities for calculating



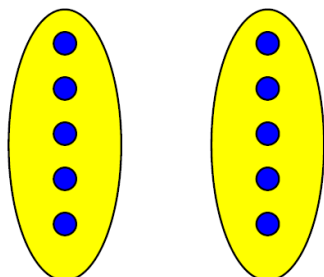
Use grouping to support early division  
(See multiplication)



'How many faces altogether? How many groups of two?'



'Five groups of two'



'How many groups of 5?'  
'10 shared equally between 2 people'  
'Half of ten is five'

Continue to solve problems in practical contexts throughout Y1, and develop the language of early division, with appropriate resources.

## Written calculation strategies: Year 2

### ADDITION

Underpinning mental and oral skill, knowledge and understanding.

1. Use a number line or number grid to 100 to compare and order numbers
2. Read and write numbers to at least 100
3. Read and write numbers to one hundred in numerals and words
4. Find more than, one more, two more, five more, ten more, 20 more.
5. Use and understand range of Mathematical vocabulary
6. Count on in steps of 10 from any number
7. Understand that addition can be done in any order

### Method:

Put number in head and count on in 1s, 2s, 5s and 10s.

Put larger number first

Use numbers bonds to 20 (derive facts to 100)

Doubles to 20 (extend facts to 100)

Recognise and partition two digit numbers into tens and units

e.g.  $235=200+30+5$

Place value arrow cards.

Add a near multiple of 10 by adjusting.

Reinforce learning with equipment.

### Written recording and calculation strategies

1. Solve number problems recording using conventional signs and symbols.  
Develop recording in the context of practical work and in explaining how problems were solved.
2. Empty number boxes with missing numbers in all three positions.

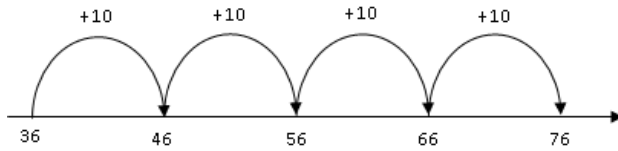
$$3 + 4 = \square$$

$$3 + \square = 7$$

$$\square + 4 = 7$$

3. Use blank number line (in conjunction with a 100 square) to count on in 1s or 10s (or head)

$$36 + 40 =$$

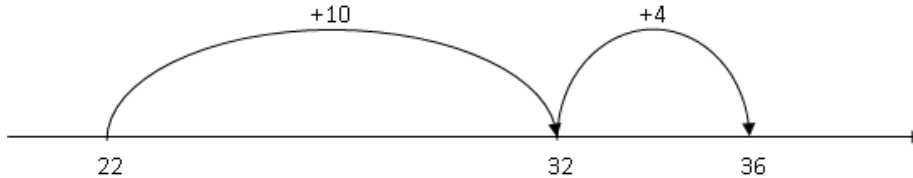


4. Use arrow cards and place value materials to partition (and part partition) numbers into tens and units to add

$$22 + 14$$



5. Add partitioned numbers on a blank number line. E.g.



6. Apply increasing knowledge of written method through recording addition of 1 and 2 digit numbers as vertical calculation  
 a. First using an expanded method (with no crossing the boundaries)

$$\begin{array}{r}
 22 + 14 = \\
 \begin{array}{r}
 20 + 2 \\
 + 10 + 4 \\
 \hline
 30 + 6 \\
 \hline
 =36
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 54 + 5 = \\
 \begin{array}{r}
 50 + 4 \\
 + \quad 5 \\
 \hline
 50 + 9 \\
 \hline
 =59
 \end{array}
 \end{array}$$



- b. Then shortening this to a more compact expanded method once children are secure with the place value of each digit (with no crossing the boundaries)

$$\begin{array}{r}
 22 \\
 + 14 \\
 \hline
 30 \\
 6 \\
 \hline
 36
 \end{array}$$

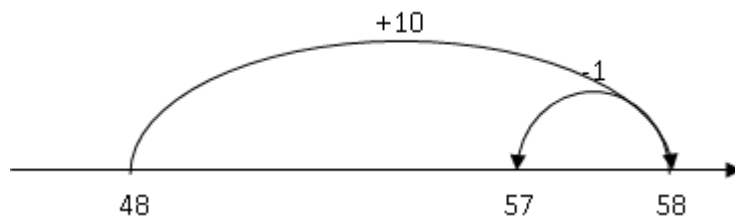
$$\begin{array}{r}
 54 \\
 + 5 \\
 \hline
 50 \\
 4 \\
 \hline
 59
 \end{array}$$

- c. Moving to a compact method (with no crossing the boundaries)

$$\begin{array}{r}
 22 \\
 + 14 \\
 \hline
 36
 \end{array}$$

$$\begin{array}{r}
 54 \\
 + 5 \\
 \hline
 59
 \end{array}$$

7. Adding 9 by adding 10 and adjusting (also 19)



## SUBTRACTION

Underpinning mental and oral skills, knowledge and understanding.

1. Number line to 50 and 100
2. Sections of number line to 1000
3. Number grid to 100
4. Empty number lines
5. Less than (fewer than), one less (fewer), ten less (fewer), five less (fewer), 10 less (fewer), 20 less (fewer)
6. Method. Put largest number in head and count back in 1s, 2s, 5s and 10s.

7. Inverse of number bonds to 20 in reverse  $20-7=13$  (derive facts to 100)
8. Halves to 20 (extend facts to 100)
9. Place value for 2,3 and 4 digit numbers
10. Use part partitioning
11. Finding the difference by counting up
12. Understand that the order of numbers affects the answer when subtracting

### Written recording and calculation strategies

1. Solve number problems recording using conventional signs and symbols.
2. Develop recording in the context of practical work and in explaining how problems were solved.
3. Empty number boxes with missing numbers in all three positions

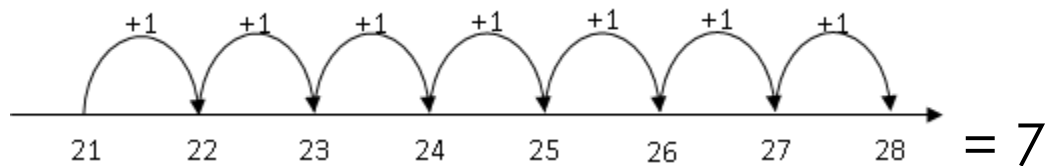
$$10 - 7 = \square$$

$$10 - \square = 3$$

$$\square + 3 = 10$$

4. Use blank number line to find the difference between numbers that are close by counting in 1s and 10s

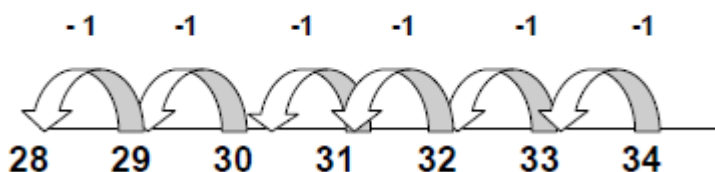
$$28 - 21 =$$



5. Partitioning numbers into tens and units to subtract on a blank number line.

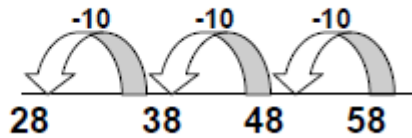
a. Initially in ones

$$34 - 6 = 28$$



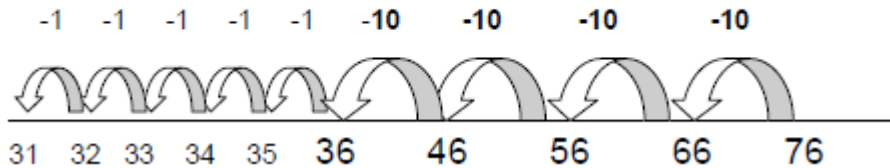
b. And in tens...

$$58 - 30 = 28$$



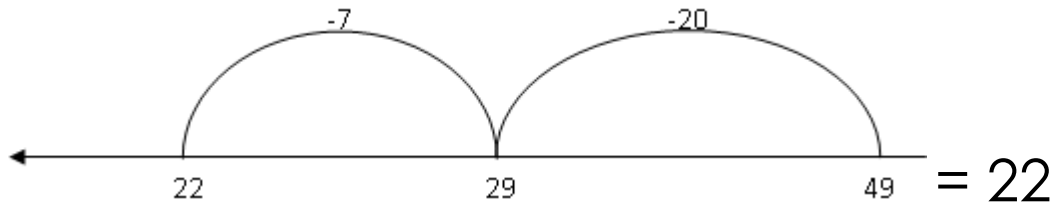
c. Then combining these (in conjunction with using a hundred square to show jumps in tens and ones)

$$76 - 45 = 31$$



This then becomes more efficient jumps along a number line.

e.g.  $49 - 27 =$  can also be written  $49 - 20 - 7 =$



5. Apply increasing knowledge of written method through recording subtraction of 1 and 2 digit numbers as vertical calculation

a. First using an expanded method (with no crossing the boundaries)

$$78 - 3 =$$

$$\begin{array}{r} 70 \quad 8 \\ - \quad \quad 3 \\ \hline 70 \quad 5 \end{array} = 75$$

$$54 - 12 =$$

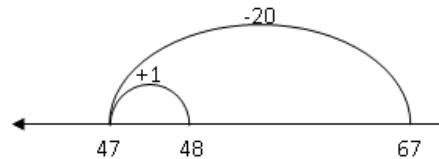
$$\begin{array}{r} 50 \quad 4 \\ - 10 \quad 2 \\ \hline 40 \quad 2 \end{array} = 42$$

- b. Moving to a compact method, once children are secure with the value of each digit (with no crossing the boundaries)

$$\begin{array}{r} 78 \\ - 3 \\ \hline 75 \end{array}$$

$$\begin{array}{r} 54 \\ - 12 \\ \hline 42 \end{array}$$

6. Subtracting 9 by subtracting 10 and adjusting using mental methods and informal jottings (also 19)



## MULTIPLICATION

Underpinning mental and oral skills, knowledge and understanding.

1. Recognise odd and even
2. Show that multiplication can be done in any order
3. Recall doubles of numbers to 20
4. Understand multiplication as repeated addition
5. Know by heart the facts for the 2,5 and 10 times tables
6. Understand the meaning of the sign X
7. Understand and use multiplication in problem solving

### Methods:

Counting in 2s, 5s and 10s

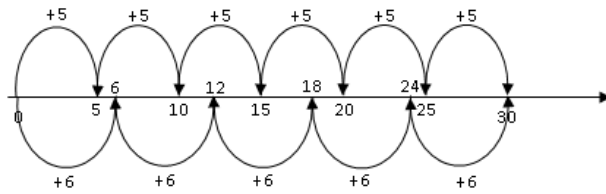
Use place value to understand the effect of multiplying by 10

Use concrete materials to complete multiplication problems (see year 1 for examples)

## Written recording and calculation strategies

1. Multiplication as repeated addition in any order. (Using blank number line.)

$$6 \times 5 = 30 \quad 5 \times 6 = 30$$



2. Arrays as a form of recording

$$6 \times 3 =$$



## DIVISION

Underpinning mental and oral skills, knowledge and understanding.

1. Halves of numbers to 20
2. Understanding division as repeated subtraction
3. Recall division facts for 2,5 and 10 x tables
4. Recognition of sign  $\div$
5. Use division in problem solving

### Methods:

Counting in 2s, 5s and 10s

Use place value to understand the effect of multiplying by 10

Use concrete materials to complete multiplication problems

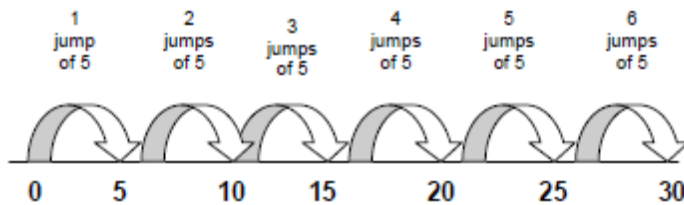
## Written recording and calculation strategies

1. Reintroduce division as sharing and grouping (see year 1).
2. Division as repeated subtraction (moving away from sharing) on an empty number line

a. Counting both forwards

$$30 \div 5 = 6$$

'How many jumps of five make thirty?'

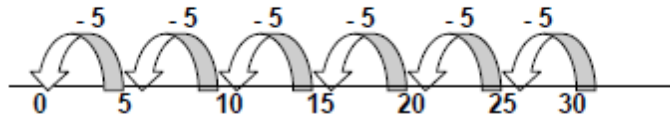


b. and backwards

Also jump back to make the link with repeated subtraction:

$$30 \div 5 = 6$$

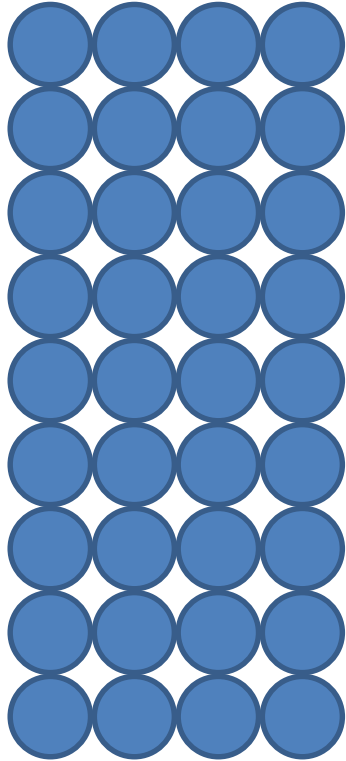
'How many groups of five?'



c. Use groupings (arrays) as a form of recording making links with multiplication facts

(See multiplication)

$$36 \div 4 =$$



$$= 9$$

## Written calculation strategies: Year 3

### ADDITION

1. Underpinning mental and oral skills, knowledge and understanding.
2. Number line to 50 and 100
3. Sections of number line to 1000
4. Place value chart/ arrow cards to 1000
5. Number grid to 100
6. Empty number lines
7. More than, one more, ten more, 20 more, 100 more
8. Compare, read, write and order numbers up to 1000

### Method:

Put number in head and count on in 1s, 10s and 100s

Putting larger number first

Number bonds to 20 (extend facts to 100)

Doubles to 20 (extend facts to 100)

Format  $21=20+1$   $235 = 200 + 30 + 5$

Place value arrow cards

Add a near multiple of 10 by adjusting

### Written recording and calculation strategies

1. Solve number problems recording using conventional signs and symbols.  
Develop recording in the context of practical work and in explaining how problems were solved.
2. Empty number boxes with missing numbers in all three positions.

$$34 + 5 = \square$$

$$34 + \square = 39$$

$$\square + 5 = 39$$

3. Add HTU + U, HTU+TU, HTU+HTU mentally, using informal jotting to support calculations, such as using an empty number line  
Develop and build on informal year 2 methods and strategies such as partitioning and part partitioning



4. Use formal written methods to add up to three digit numbers
- a. Revise using an expanded method (crossing the boundary in one column)

$$223 + 142 =$$

$$\begin{array}{r} 200 + 20 + 3 \\ + 100 + 40 + 2 \\ \hline 300 + 60 + 5 \\ \hline =365 \end{array}$$

$$349 + 143 =$$

$$\begin{array}{r} 300 + 40 + 9 \\ + 100 + 40 + 3 \\ \hline 400 + 80 + 12 \\ \hline =492 \end{array}$$

- b. Develop this using a method that requires less recording, once children have a secure understanding of the place value of each digit. **Begin by adding the units** (crossing the boundary in one column)

$$\begin{array}{r} 223 \\ + 142 \\ \hline 5 \\ 60 \\ 300 \\ \hline 365 \end{array}$$

$$\begin{array}{r} 349 \\ + 143 \\ \hline 12 \\ 80 \\ 400 \\ \hline 492 \end{array}$$

- c. Move to a compact method (crossing the boundary in one column)

$$\begin{array}{r} 223 \\ + 142 \\ \hline 365 \end{array}$$

$$\begin{array}{r} 3^{14}9 \\ + 143 \\ \hline 492 \end{array}$$

When children are confident, extend with examples where it is necessary to bridge in more than one column.

This can be further developed by adding HTU+TU using the column method.

## **SUBTRACTION**

Underpinning mental and oral skills, knowledge and understanding.

1. Number line to 50 and 100
2. Sections of number line to 1000
3. Place Value chart/ arrow cards to 1000
4. Number grid to 100
5. Empty number lines
6. Less than (fewer), one less (fewer), ten less (fewer), 20 less (fewer)

### **Methods:**

Put number in head and count back in 1s, 10s and 100s.

Count back from largest number

Inverse of number bonds to 20 (extend to 100)

Halves to 20 (extend facts to 100)

Place value for 2, 3 and 4 digit numbers

Partitioning format

Subtract a near multiple of 10 by adjusting

### **Written recording and calculation strategies**

1. Extend subtraction to three digit numbers
2. Solve number problems using conventional signs and symbols. Developing recording in the context of practical work and in explaining how problems are solved.
3. Empty number box problems (as for addition)
4. Counting back using an empty number line or in the head
5. Counting in 1s, 10s and 100s
6. Using mental methods to subtract HTU-HTU, HTU-TU, HTU-U supported by informal jottings, with calculations that bridge 100

See Year 2 for methods and strategies and extend to include jumps of hundreds

7. Use formal written methods to subtract up to three digit numbers
- a. First using an expanded method beginning with subtracting the least significant figure where exchange is not required

$$287 - 142 =$$

$$\begin{array}{r}
 200 \quad 80 \quad 7 \\
 - 100 \quad 40 \quad 2 \\
 \hline
 100 \quad 40 \quad 5 \\
 \hline
 \end{array} = 145$$

Including examples that cross the boundary in one column

$$834 - 217 =$$

$$\begin{array}{r}
 800 \quad 3^2 0 \quad 14 \\
 - 200 \quad 10 \quad 7 \\
 \hline
 600 \quad 10 \quad 7 \\
 \hline
 \end{array} = 617$$

Use base ten materials to support children's understanding of the exchange and partitioning that has taken place

- b. Moving to a compact method (crossing the boundary in one column)

$$\begin{array}{r}
 87 \\
 - 42 \\
 \hline
 45
 \end{array}
 \qquad
 \begin{array}{r}
 8 \quad 3^2 \quad 14 \\
 - 2 \quad 1 \quad 7 \\
 \hline
 6 \quad 1 \quad 7
 \end{array}$$

Use the language of place value to ensure understanding, while continuing to support this using base ten materials.

If children are confident, extend use of the formal; written method with numbers over 100, returning to base ten materials and the expanded method first if necessary

## MULTIPLICATON

Underpinning mental and oral skills, knowledge and understanding.

- 1 Understand multiplication as repeated addition
- 2 Know by heart the facts for tables 2,**3,4,5 8** and 10
- 3 Recall the division facts for the 8 times table
- 4 Recognise sign X
- 5 Use multiplication in problem solving
- 6 Doubles of numbers to 100
- 7 Understand that multiplication can be done in any order

### Methods:

Count in multiples of 4, 8, 50 and 100

Multiplication of a number by 10,100 and 1000

Doubling a 2/3 digit number by partitioning

Using repeated doubling, e.g. X4

Derive multiplication facts based on the facts that they already know

Continue to use number lines and arrays to support multiplication (See year 2)

Use understanding of partitioning to multiply TUXU mentally and progressing to a formal written method

e.g.

**24 x 3 can be calculated as:**

$$\begin{array}{r} 20 \times 3 \quad + \quad 4 \times 3 = \\ 60 \quad \quad + \quad 12 = \\ 72 \end{array}$$

Empty number boxes with missing numbers in all three positions.

$$8 \times 5 = \square$$

$$6 \times \square = 30$$

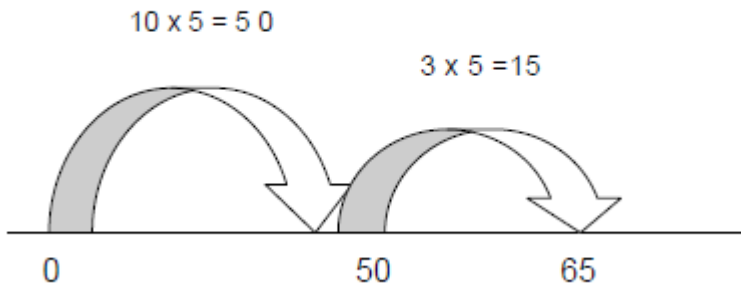
$$\square \times 4 = 20$$

Use mental strategies supported by informal jottings taught in years 2 and 3

## Written recording and calculation strategies

1. Multiplication as repeated addition on a number line (see year 2)
2. Use arrays to introduce the grid method
3. Develop written methods for multiplying TU x U
  - a. Initially partitioning using a number line

**$13 \times 5 = 65$**



- b. Moving on to the grid method for TU x U where the T is a teen number

$13 \times 3 =$

X	10	3
3	30	9

$30 + 9 = 39$

Move to using an expanded column method using Tux T where the T is a , ensuring that the link between each step and the grid method is made explicit

	1	3
x		3
		9
+	3	0
	3	9

becomes

	1	3
x		3
		9
	3	9

Including examples that give rise to 'carrying'

		1	3	
	x		8	
	<hr/>			
		2	4	
	+	8	0	
	<hr/>			
	1	0	4	
				becomes
		2	1	3
	x		8	
	<hr/>			
	1	0	4	
	<hr/>			

If children are confident, progress to multiplying other TUxU (see year 4)

## **DIVISION**

Underpinning mental and oral skills, knowledge and understanding.

- 1 Understand division as repeated subtraction
- 2 Halves of numbers to 100
- 3 Know facts for 2,3,4,5 and 10 times tables
- 4 Use division in problem solving using repeated subtraction
- 5 Estimate and approximate
- 6 Understand that division is the inverse of multiplication

### **Methods:**

Count back in multiples of 4, 8, 50 and 100

Doubling a 2/3 digit number by partitioning

Using repeated halving

Empty number boxes with missing numbers in all three positions.

$$8 \div 2 = \square$$

$$24 \div \square = 4$$

$$\square \div 3 = 10$$

## Written recording and calculation strategies

- 1 Division of  $TU \div U$  and  $U \div U$  as repeated subtraction using a blank number line counting both forwards and backwards (see year 2)
- 2 Finding remainders after division (see year 2)
- 3 Introduce formal layout for division using division facts that the children know

$$24 \div 3 =$$

This can also be recorded as...

$$\begin{array}{r} 8 \\ 3 \overline{) 24} \end{array}$$

## Written calculation strategies: Year 4

### ADDITION

Underpinning mental and oral skills, knowledge and understanding.

- 1 Number line to 100
- 2 Sections of number line -100 to 1000+
- 3 Number grid to 100
- 4 Empty number lines
- 5 Recognise place value in numbers up to 10 000
- 6 Compare, read write and order numbers to to 10000

### Methods:

Count on in 10s, 100s and 1000s

Partitioning  $21 = 20 + 1$     $235 = 200 + 30 + 5$

Place value charts and arrow cards to 10 000

Add a near multiple of 10 by adjusting

Use known facts to add mentally

Crossing the 100 and 1000 boundary

Round numbers to the nearest 10, 100 or 1000 to estimate

Add 10, 100 and 1000 to a given number

## Written recording and calculation strategies

- 1 Solve number problems recording using conventional signs and symbols.  
Develop recording in the context of practical work and in explaining how problems were solved.
- 2 Empty number boxes with missing numbers in all three positions.
- 3 Continue work from year 3 using empty number lines to add up to 4 digit numbers
- 4 Develop use of a standard written method for addition of ThHTU+ThHTU.
- 5 Introduce addition of numbers with up to two decimals to solve simple money and measure problems

$$\begin{array}{r}
 \text{£}20 + \text{£}2 + 20\text{p} + 4\text{p} \\
 + \text{£}30 + \text{£}1 + 90\text{p} + 7\text{p} \\
 \hline
 \text{£}50 + \text{£}3 + \text{£}1.10 + 11\text{p} \\
 \hline
 =\text{£}54.21
 \end{array}$$

- a. Once children can confidently (and instantly) identify the value of each digit, reduce the recording needed, but continue to add each digit separately (crossing the boundary in more than one column)

$$2249 + 2914 =$$

$$\begin{array}{r}
 2\ 2\ 4\ 9 \\
 +\ 2\ 9\ 1\ 4 \\
 \hline
 \phantom{2\ 2\ 4\ 9} \\
 \phantom{2\ 2\ 4\ 9} \\
 \phantom{2\ 2\ 4\ 9} \\
 \phantom{2\ 2\ 4\ 9} \\
 \phantom{2\ 2\ 4\ 9} \\
 \hline
 5\ 1\ 6\ 3
 \end{array}$$

$$\text{£}22.24 + \text{£}31.97 =$$

$$\begin{array}{r}
 2\ 2\ .\ 2\ 4 \\
 +\ 3\ 1\ .\ 9\ 7 \\
 \hline
 \phantom{2\ 2\ .\ 2\ 4} \\
 \phantom{2\ 2\ .\ 2\ 4} \\
 \phantom{2\ 2\ .\ 2\ 4} \\
 \phantom{2\ 2\ .\ 2\ 4} \\
 \phantom{2\ 2\ .\ 2\ 4} \\
 \hline
 \text{£}\ 5\ 4\ .\ 2\ 1
 \end{array}$$



Use the language of place value to ensure understanding

- b. Move to a compact method formal method (crossing the boundary in more than one column)

$$2249 + 2914 =$$

$$\begin{array}{r} \overset{1}{2} \ 2 \ \overset{1}{4} \ 9 \\ + \ 2 \ 9 \ 1 \ 4 \\ \hline 5 \ 1 \ 6 \ 3 \end{array}$$

$$£22.24 + £31.97 =$$

$$\begin{array}{r} 2 \ \overset{1}{2} \ . \ \overset{1}{2} \ 4 \\ + \ 3 \ 1 \ . \ 9 \ 7 \\ \hline £ \ 5 \ 4 \ . \ 2 \ 1 \end{array}$$

Develop with addition of decimals in the context of money and measures.

## SUBTRACTION

Underpinning mental and oral skills, knowledge and understanding

- 1 Number line to 100
- 2 Sections of number line to 1000+
- 3 Number grid to 100

### Methods:

Count back in 10s, 100s and 1000s

Halves to 20 (extend facts to 100)

Place value for 2, 3 and 4 digit numbers (partitioning format)

Subtract a near multiple of 10 by adjusting

Use known number facts to subtract mentally

Subtract multiples of 10, 100 and 1000 from 2, 3 and 4 digit numbers

Crossing the 100 and 1000 boundary Finding difference using number line

### Written recording and calculation strategies

- 1 Solve number problems using conventional signs and symbols. Develop recording in the context of practical work and in explaining how problems are solved.
- 2 Empty number box problems with numbers missing in all three position

- 3 Build on prior learning from year 3 using empty number lines to find the difference between numbers with up to three digits that are close together
- 4 Develop use of standard written methods to subtract numbers with up to four digits (ThHTU- ThHTU)
- 5 Use expanded methods to explore subtraction of numbers with up to two decimal places in the context of money and measures.
- 6 First using an expanded method (crossing the boundary in more than one column) and continue to use base ten materials to support understanding.

$$3684 - 2917 =$$

3000	1600	80	14
2000		70	
- 2000	900	10	7
0	700	60	7
	=767		

$$£54.28 - £36.19$$

£50	£14	20p	18p
£40		10p	
- £30	£6	10p	9p
£10	£8	0p	9p
	=£18.09		

- 7 Once children can confidently (and instantly) identify the value of each digit, reduce the recording needed, but continue to subtract each digit separately, beginning with the least significant digit (crossing the boundary in more than one column)

$$3684 - 2917 =$$

<sup>3</sup> 2	<sup>1</sup> 6	<sup>8</sup> 7	<sup>1</sup> 4
- 2	9	1	7
		7	
	6	0	
	7	0	0
0	0	0	0
	7	6	7

$$£54.28 - £36.19$$

<sup>5</sup> 4	<sup>1</sup> 4	.	<sup>2</sup> 1	<sup>1</sup> 8
- 3	6	.	1	9
			9	
			0	0
	8	.	0	0
1	0	.	0	0
	1	8	.	0
			0	9

Develop this further with the introduction of decimal numbers in the context of money and measures.

## MULTIPLICATION

Underpinning mental and oral skills, knowledge and understanding

- 1 Understand multiplication as repeated addition
- 2 Know by heart the facts for tables 2,3,4,5,6,8 and 10
- 3 Use multiplication in problem solving
- 4 Doubles of numbers to 100
- 5 Understand that multiplication can be done in any order
- 6 Recall multiplication facts up to 12x12

### Methods:

Counting in multiples of 6, 7, 9, 25 and 1000

Multiplication of a number by 10,100 and 1000

Doubling a 2/3 digit number by partitioning

Using repeated doubling, e.g. X4

Use understanding of partitioning, factors and commutativity to multiply TUxU mentally

e.g.

24 x 3 can be calculated as:

$$20 \times 3 + 4 \times 3 =$$

$$12 \times 3 \times 2 =$$

$$6 \times 3 \times 2 \times 2 =$$

### Written recording and calculation strategies

- a. Revise the TU x U using the grid, expanded and compact methods (see year 3)
- b. Revise the use of grid method to ensure secure understanding of the place value of digits with HTUxU

$$323 \times 3 =$$

X	300	20	3
3	900	60	9
			= 969

Include examples that cross the boundaries

$$364 \times 4 =$$

X	300	60	4
3	900	180	12
= 1092			

c. Move to using an expanded column method, ensuring that the link between each step and the grid method is made explicit

	3	2	3	
x			3	
			9	(3x3)
		6	0	(3x20)
	9	0	0	(3x300)
	9	6	9	

	3	6	4	
x			3	
			1	2
		1	8	0
	9	0	0	
	1	0	9	2

## DIVISION

Underpinning mental and oral skills, knowledge and understanding

- 1 Understand division as repeated subtraction
- 2 Find halves of numbers to 100
- 3 Derive division facts for all multiplication facts up to 12 x 12
- 4 Use division in problem solving
- 5 Estimate and approximate
- 11 Understand that division is the inverse of multiplication

### Methods:

Counting back in multiples of 6, 7, 9, 25 and 1000

Divide TU and HTU numbers by 10 and 100

Halving a TU and HTU digit number by partitioning and part partitioning

Using repeated halving

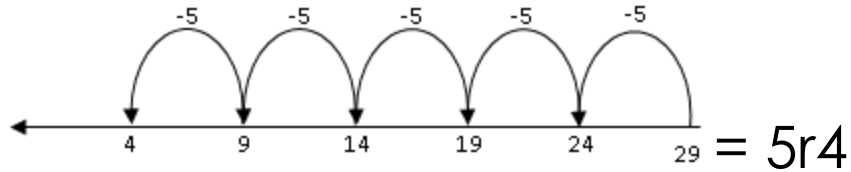
### Written recording and calculation strategies

- 1 Use knowledge of place value and number facts to complete division of TU by U, HTU by U and HTU by TU
  - a. Revise the use of an empty number line to complete division as

repeated subtraction (see year 2)

- b. Revise use of the formal layout as seen in year 3, including examples that give rise to remainders
- c. Use an empty number line to divide numbers that leave remainders

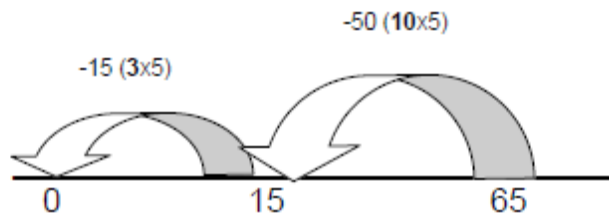
$$29 \div 5 =$$



- d. Revise written division strategies using an expanded horizontal method that builds on the children's understanding of partitioning (see year 3)

Using a number line to explore larger jumps that are multiples of the divisor

$$65 \div 5 = 13$$



Which leads into partitioning

$$\begin{aligned} 65 \div 5 &= \\ &= 50 \div 5 = 10 \\ &= 15 \div 5 = 3 \\ &= 10 + 3 = 13 \end{aligned}$$

$$\begin{aligned} 148 \div 4 &= \\ &= (100 + 40 + 8) \div 4 \\ &= 25 + 10 + 2 \\ &= 37 \end{aligned}$$

e. Introduce a vertical method for division that builds on the partitioning (chunking)

$$\begin{array}{r}
 3 \overline{) 69} \\
 - 30 \\
 \hline
 39 \\
 - 30 \\
 \hline
 9 \\
 - 9 \\
 \hline
 0
 \end{array}
 \begin{array}{l}
 (10 \times 3) \\
 (10 \times 3) \\
 (3 \times 3) \\
 \\
 = 23
 \end{array}$$

$$\begin{array}{r}
 4 \overline{) 148} \\
 - 100 \\
 \hline
 48 \\
 - 40 \\
 \hline
 8 \\
 - 8 \\
 \hline
 0
 \end{array}
 \begin{array}{l}
 (25 \times 4) \\
 (10 \times 4) \\
 (2 \times 4) \\
 \\
 = 37
 \end{array}$$

# Written calculation strategies: Year 5

## Addition

Underpinning mental and oral skills, knowledge and understanding

- 1 Number line to 100
- 2 Negative number line
- 3 Decimal number line
- 4 Sections of number line to 1000+
- 5 Number grid to 100
- 6 Empty number lines
- 7 Place value charts to 1 000 000
- 8 Arrow cards to 1000
- 9 Decimal arrow cards
- 10 Compare, order, read and write numbers to 1 000 000
- 11 Read and interpret negative numbers in context

## Methods:

Continue use of empty number lines

Use rounding to estimate and check the reasonableness of answers

Continue methods as for year 3+4

## Written recording and calculation strategies

Empty number lines

As for year 3 and 4

EXTENDED METHODS

As for year 4

Extend to increasingly large numbers, three or more numbers and to decimals up to three places

Consolidate use of compact column addition with numbers crossing the boundaries.

# SUBTRACTION

Underpinning mental and oral skills, knowledge and understanding

- 1 Number line to 100
- 2 Negative number line
- 3 Decimal number line
- 4 Sections of number line to 1000+
- 5 Number grid to 100
- 6 Empty number lines

## Methods:

Continue work using empty number lines

Continue methods as for year 4

Find a difference between two close numbers on a number line

## Written recording and calculation strategies

- 1 Empty number line for larger numbers and decimals as appropriate  
As for year 3 and 4
- 2 Revise expanded subtraction method for numbers up to 1 000 000 and those with three decimals  
As year 4
- 3 Once children have a secure understanding of the value of digits and of the processes involved in exchange or 'carrying', move to a compact written method for subtraction.

$$\begin{array}{r} \phantom{0} 5 \phantom{0} 14 \phantom{0} 12 \\ \phantom{0} 6 \phantom{0} 5 \phantom{0} 3 \phantom{0} 12 \\ - \phantom{0} 1 \phantom{0} 8 \phantom{0} 4 \phantom{0} 9 \\ \hline \phantom{0} 4 \phantom{0} 6 \phantom{0} 8 \phantom{0} 3 \end{array}$$

$$\begin{array}{r} \phantom{0} 2 \phantom{0} 14 \phantom{0} 10 \\ \phantom{0} 3 \phantom{0} 5 \phantom{0} . \phantom{0} 4 \phantom{0} 17 \\ - \phantom{0} 1 \phantom{0} 6 \phantom{0} . \phantom{0} 9 \phantom{0} 8 \\ \hline \phantom{0} 1 \phantom{0} 8 \phantom{0} . \phantom{0} 1 \phantom{0} 9 \end{array}$$



# MULTIPLICATION

Underpinning mental and oral skills, knowledge and understanding

- 1 Understand multiplication as repeated addition
- 2 Know by heart the facts for all tables
- 3 Use multiplication in problem solving

## Methods:

Multiplication of a number by 10, 100 and 1000

Multiply decimals by 10, 100 or 1000

Count up in powers of ten from any number up to 1 000 000

Doubling number by partitioning

Using repeated doubling

Use knowledge of factors and factor pairs when calculating

Use understanding of commutativity to calculate

## Written recording and calculation strategies

- 1 Continue with methods as in years 3 and 4 for ThHTUxTU, revising grid and expanded ,methods first
- 2 Develop expanded column method to a short multiplication method for ThHTUxU once children have a secure understanding of place value and the processes involved.

So

$$\begin{array}{r}
 \begin{array}{cccc}
 & 2 & 1 & 2 & 3 \\
 \times & & & & 3 \\
 \hline
 & & & & 9 \\
 & & & 6 & 0 \\
 & & 3 & 0 & 0 \\
 & 6 & 0 & 0 & 0 \\
 \hline
 6 & 3 & 6 & 9 & 
 \end{array}
 \end{array}$$

becomes

$$\begin{array}{r}
 \begin{array}{cccc}
 & 2 & 1 & 2 & 3 \\
 \times & & & & 3 \\
 \hline
 & 6 & 3 & 6 & 9 \\
 \hline
 \end{array}
 \end{array}$$

Including examples that cross the boundaries

$$\begin{array}{r}
 \phantom{x} \phantom{0000} 6 \phantom{00} 4 \phantom{000} 8 \phantom{0000} 2 \\
 x \phantom{00000} \phantom{00000} \phantom{00000} \phantom{00000} 4 \\
 \hline
 \phantom{00000} \phantom{00000} \phantom{00000} \phantom{00000} 8 \\
 \phantom{00000} \phantom{00000} \phantom{00000} 3 \phantom{00000} 2 \phantom{00000} 0 \\
 \phantom{00000} 1 \phantom{00000} 6 \phantom{00000} 0 \phantom{00000} 0 \\
 \hline
 2 \phantom{00000} 4 \phantom{00000} 0 \phantom{00000} 0 \phantom{00000} 0 \\
 \hline
 2 \phantom{00000} 5 \phantom{00000} 9 \phantom{00000} 2 \phantom{00000} 8
 \end{array}$$

$$\begin{array}{r}
 \phantom{x} \phantom{0000} \phantom{0000} 1 \phantom{0000} 3 \phantom{0000} \\
 \phantom{x} \phantom{0000} 6 \phantom{0000} 4 \phantom{0000} 8 \phantom{0000} 2 \\
 x \phantom{00000} \phantom{00000} \phantom{00000} \phantom{00000} 4 \\
 \hline
 2 \phantom{00000} 5 \phantom{00000} 9 \phantom{00000} 2 \phantom{00000} 8
 \end{array}$$

becomes

3 Introduce expanded long multiplication for HTUXTU and ThHTU xTU, first revising the grid method and making the links between the two methods

So

x	300	40	9	
20	6000	800	180	6980
2	600	80	18	698
				7678

$$\begin{array}{r}
 \phantom{x} \phantom{0000} 3 \phantom{0000} 4 \phantom{0000} 9 \\
 x \phantom{00000} \phantom{00000} 2 \phantom{00000} 2 \\
 \hline
 \phantom{00000} \phantom{00000} \phantom{00000} 1 \phantom{00000} 8 \\
 \phantom{00000} \phantom{00000} 1 \phantom{00000} 8 \phantom{00000} 0 \\
 \phantom{00000} 6 \phantom{00000} 0 \phantom{00000} 0 \\
 \phantom{00000} 1 \phantom{00000} 8 \phantom{00000} 0 \\
 \phantom{00000} 1 \phantom{00000} 8 \phantom{00000} 0 \\
 \hline
 1 \phantom{00000} 8 \phantom{00000} 0 \phantom{00000} 0 \\
 6 \phantom{00000} 0 \phantom{00000} 0 \phantom{00000} 0 \\
 \hline
 7 \phantom{00000} 6 \phantom{00000} 7 \phantom{00000} 8
 \end{array}$$

becomes

## DIVISION

Underpinning mental and oral skills, knowledge and understanding

- 1 Understand division as repeated subtraction
- 2 Know facts for all tables
- 3 Use division in problem solving
- 4 Estimate and approximate

### Methods:

Division of a number by 10, 100 and 1000

Divide decimals by 10, 100 or 1000

Halving a number by partitioning

Count up in powers of ten from any number up to 1 000 000

Using repeated halving

Use knowledge of factors and factor pairs when calculating

## Written recording and calculation strategies

- 1 Continue with methods as in years 3 and 4
- 2 Introduce short division method for ThHTU÷U
  - a. Begin with examples that do not cross the boundary

$$\begin{array}{r} 2121 \\ 4 \overline{) 8484} \end{array}$$

- b. Moving on to examples that cross the boundary

$$\begin{array}{r} 0406 \\ 6 \overline{) 2436} \end{array}$$

- c. Include examples that give rise to remainders

$$\begin{array}{r} 0903 \text{ r}4 \\ 7 \overline{) 6325} \end{array}$$

**Remainders can also be expressed as fractions**  
**903  $\frac{4}{7}$**

# Written calculation strategies: Year 6

## ADDITION

Underpinning mental and oral skills, knowledge and understanding

- 1 Number line to 100
- 2 Sections of number line to 1000+
- 3 Negative number line. Vertical, horizontal
- 4 Decimal number line. Scales, Tenths, Hundredths and Thousandths
- 5 Number grid to 100
- 6 Empty number lines
- 7 Place Value charts to 10 000 000

### Methods:

Continue use of empty number lines

Continue methods as for year 3, 4 and 5

### Written recording and calculation strategies

As for years 3, 4 and 5

Children should continue to practise and use formal methods for larger numbers and decimals, using these strategies when problem solving.

## SUBTRACTION

Underpinning mental and oral skills, knowledge and understanding.

- 1 Number line to 100
- 2 Sections of number line to 1000+
- 3 Negative number line. Vertical, horizontal.
- 4 Decimal number line. Scales. Tenths, Hundredths, and Thousandths
- 5 Number grid to 100
- 6 Empty Number lines

## **Methods:**

Continue to work using empty number lines  
As for year 4 and 5.

## **Written recording and calculation strategies**

As for years 3, 4 and 5

Children should continue to practise and use formal methods for larger numbers and decimals, using these strategies when problem solving.

## **MULTIPLICATION**

Underpinning mental and oral skill, knowledge and understanding

- 2 Understand multiplication as repeated addition
- 3 Know by heart the facts for all tables
- 4 Use multiplication in problem solving

## **Methods:**

Multiplication of a number by 10, 100 and 1000

Multiply decimals by 10, 100 or 1000

Doubling number by partitioning

Using repeated doubling

Use understanding of factors and factor pairs to calculate mentally

Use understanding of commutativity

## **Written recording and calculation strategies**

- 1 Continue with methods as in years 3, 4 and 5
- 2 Use short column method to multiply up to  $ThHTU \times U$
- 3 Use grid method, followed by short column method to multiply  $U.th \times U$  and  $T.th \times TU$
- 4 Revise expanded long multiplication and grid method for up to  $ThHTU \times TU$  and multiplication of decimals and move on to standard long multiplication when children have a secure understanding of place value



$$977 \div 36$$

$$\begin{array}{r} 977 \\ - 360 \\ \hline \end{array} \quad (36 \times 10 = 360)$$

$$\begin{array}{r} 617 \\ - 360 \\ \hline \end{array} \quad (36 \times 10 = 360)$$

$$\begin{array}{r} 257 \\ - 180 \\ \hline \end{array} \quad (36 \times 5 = 180)$$

$$\begin{array}{r} 77 \\ 72 \\ \hline \end{array} \quad (36 \times 2 = 72)$$

$$5 \quad (10 + 10 + 5 + 2) = 27 \text{ Remainder } 5$$

$$= 27 \text{ r } 5$$


Compact method for more able children

0 2 7.1 3 8 8 \*

Symbol to represent recurring

$$36 \overline{) 97257.50140320}$$

# Whole School Overview

	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<b>Meth od</b>	Count 2 or more sets. Find total by counting all.		Count on in 1s 10s or 100s by partitioning the smaller number	Count on by partitioning both numbers	Partition and add mentally	Expanded column addition – adding most significant digit first	Expanded column addition adding least significant first	Column addition using carrying 'on the doorstep'
<b>Recor ding</b>	Use concrete apparatus  Record simple number sentences  Using + and =	Use concrete apparatus  Record simple number sentences  Using + and =  5 + 8 =	Pictorial and visual images representations   3 + 2 = 5 number sentences  _____	62 + 48 = 110  Start at zero  +60 +40 +8 +2  _____	<b>63 + 48 =</b>  <b>60 + 40 = 100</b>  <b>8 + 2 = 10</b>  <b>100 + 10 = 110</b>		<b>342 + 186 =</b>	<b>4 8 2</b> <u><b>+ 2 3 9</b></u> <u><b>7 2 1</b></u> <b>1 1</b>



<p><b>Points to note</b></p>	<p>Teacher to model calculations on a number line once children have already answered them.</p>	<p>Teacher to model calculations on a number line once children have already answered them.</p>	<p>Children may use different variations of recording e.g. different size jumps as they become more efficient</p>	<p>Children may use different variations of recording e.g. different size jumps as they become more efficient</p>	<p>Once children are confident with place value they may record without partitioning.</p>	<p>In preparation for column addition, start by adding the most significant digit first then move towards adding the least significant digit first.</p>	<p>Refer to the value of the digit not the name e.g.  73  70, not 7</p>	<p>When carrying say carry 10 not 1</p>
<p><b>Mental strategies needed</b></p>	<p>Know that additions can be done in any order  Able to count in 1s</p>	<p>Know that additions can be done in any order  Able to count in 1s</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Able to partition 2 and 3 digit numbers</b></li> <li><input type="checkbox"/> <b>Able to count on in 1s, 10s and 100</b></li> <li><input type="checkbox"/> <b>Know number bonds to 10</b></li> <li><input type="checkbox"/> <b>Able to add multiples of 100, 10 and 1 mentally</b></li> </ul>		<ul style="list-style-type: none"> <li><input type="checkbox"/></li> <li><input type="checkbox"/> <b>Secure understanding of place value</b></li> <li><input type="checkbox"/> <b>Able to add mentally a multiple of 100 10 and 1</b></li> </ul>			

