

**TANKERSLEY C OF E (A) PRIMARY
SCHOOL
PROGRESSION IN WRITTEN
MATHEMATICAL CALCULATIONS
2017-2018**



'A love of learning developed in a Christian environment.'



Progression in Maths Calculations at Tankersley St Peter's Primary

Our written calculations policy has been written in line with the **National Curriculum for Mathematics** and contains the key pencil and paper procedures that will be taught within our school. It has been written to ensure consistency and progression throughout the school and reflects a whole school agreement.

Aims of the policy

- *To ensure consistency and progression in our approach to calculations.
- *To ensure that children develop an efficient and reliable written method of calculations for all 4 operations.
- *To ensure that children can use these methods accurately with confidence and understanding.

How to use this policy

- *Use the policy as the basis for your written calculations /arithmetic planning.
- *Always use Assessment for Learning to identify next steps in learning.
- *Encourage children to make sensible choices about the methods they use when solving problems.
- *Encourage children to talk about and explain what they are doing.

This table shows the progression of the National Curriculum objectives for written calculations from Year 1 to Year 6 in the 4 operations. Objectives underlined represent Key Performance Indicators (KPI).

	Addition	Subtraction	Multiplication	Division
Year 1	Add and subtract one-digit and two-digit numbers to 20, including zero.		Multiply and divide, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.	
Year 2	Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> □ a two-digit number and ones; □ a two-digit number and tens; □ two two-digit numbers; □ adding three one-digit numbers. 		Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs.	
Year 3	Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.		<u>Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.</u>	
Year 4	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.		Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.	
Year 5	<u>Add and subtract whole numbers with more than 4 digits.</u> Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction).		Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.	Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.
Year 6			<u>Multiply multi-digit numbers up to 4 digits by a two-digit whole number.</u> Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of <i>long multiplication</i> .	<u>Divide numbers up to 4 digits by a two-digit number and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.</u> Divide numbers up to 4 digits by a two-digit whole number using the formal written method of <i>long division</i> , and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.

Addition



Written methods for addition of whole numbers

At Tankersley St Peter's Primary, our aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and efficient written methods of calculation for addition which they know they can rely on when mental methods are not appropriate. Our policy shows the progression in building up to using an efficient written method for addition of whole numbers by the end of Year 6.

To add successfully, children need to be able to:

- recall all addition pairs to $9 + 9$ and complements in 10;
- add mentally a series of one-digit numbers, such as $5 + 8 + 4$;
- add multiples of 10 (such as $60 + 70$) or of 100 (such as $600 + 700$) using the related addition fact, $6 + 7$, and their knowledge of place value;
- partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways.

Note: It is important that children's mental methods of calculation are practiced on a regular basis and secured alongside their learning and use of an efficient written method for addition.

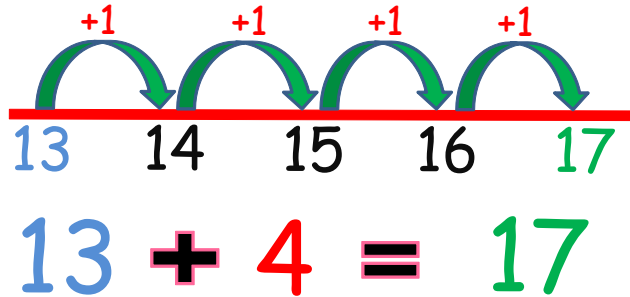
Using and Applying/Reasoning

Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measures)

Progression in Addition

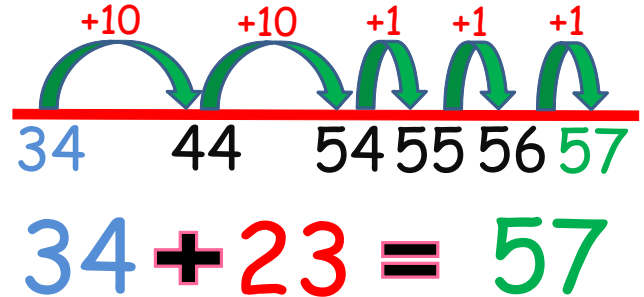
Year 1

I can add one-digit and two-digit numbers to 20, including zero.



Year 2

I can add numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers; adding three one-digit numbers.



Year 3

I can add numbers with up to three digits, using formal written methods of columnar addition.

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Year 4

I can add numbers with up to 4 digits using the formal written methods of columnar addition.

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Year 5

I can add whole numbers with more than 4 digits, including using formal written methods of columnar addition.

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Year 6

I can add whole numbers with more than 4 digits, including using formal written methods of columnar addition.

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Subtraction



Written methods for subtraction of whole numbers

Our aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use efficient written methods accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and efficient written methods of calculation for subtraction which they know they can rely on when mental methods are not appropriate.

Our policy shows the progression in building up to using an efficient method for subtraction of up to 5 whole numbers by the end of Year 6.

To subtract successfully, children need to be able to:

- recall all addition and subtraction facts to 20;
- subtract multiples of 10 (such as $160 - 70$) using the related subtraction fact, $16 - 7$, and their knowledge of place value;
- partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into $70 + 4$ or $60 + 14$).

Note: It is important that children's mental methods of calculation are practiced and secured alongside their learning and use of an efficient written method for subtraction.

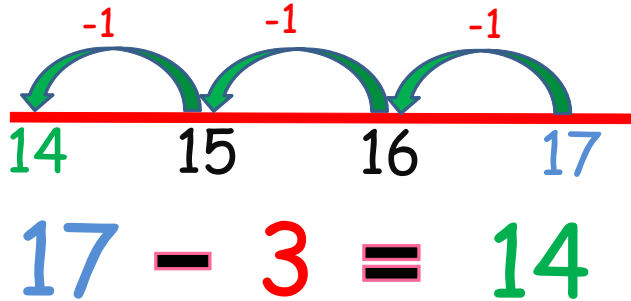
Using and Applying/Reasoning

Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measures).

Progression in Subtraction

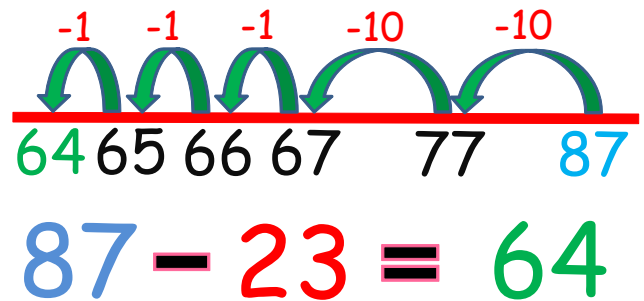
Year 1

I can subtract one-digit and two-digit numbers to 20, including zero.



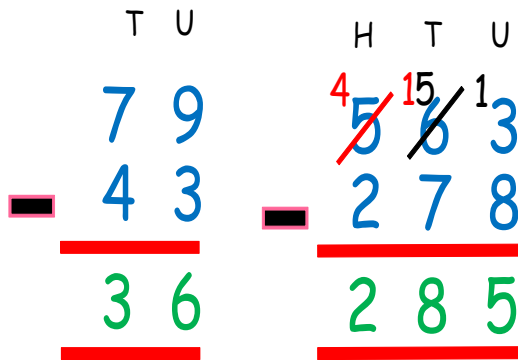
Year 2

I can subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers.



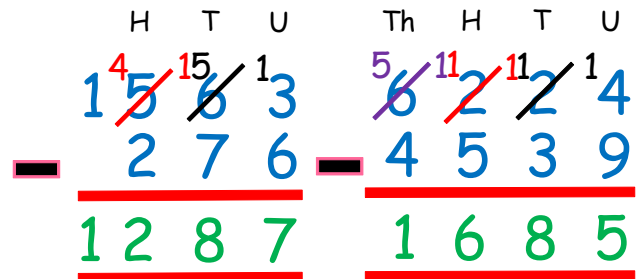
Year 3

I can subtract numbers with up to three digits, using formal written methods of columnar subtraction.



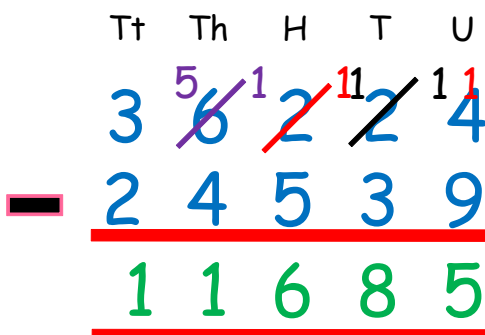
Year 4

I can subtract numbers with up to 4 digits using the formal written methods of columnar subtraction.



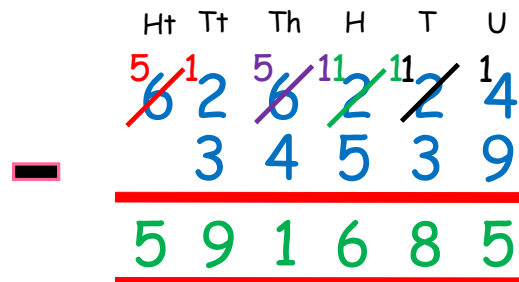
Year 5

I can subtract whole numbers with more than 4 digits, including using formal written methods of columnar subtraction.



Year 6

I can subtract whole numbers with more than 4 digits, including using formal written methods of columnar subtraction.



Multiplication



Written methods for multiplication of whole numbers

Our aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use efficient written methods accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and efficient written methods of calculation for multiplication which they know they can rely on when mental methods are not appropriate.

Our policy shows the progression in building up to using an efficient method for long multiplication by the end of Year 6.

To multiply successfully, children need to be able to:

- recall all multiplication facts to 12×12 ;
- partition numbers into multiples of one hundred, ten and one;
- work out products such as 70×5 , 70×50 , 700×5 or 700×50 using the related fact 7×5 and their knowledge of place value;
- add two or more single-digit numbers mentally;
- add multiples of 10 (such as $60 + 70$) or of 100 (such as $600 + 700$) using the related addition fact, $6 + 7$, and their knowledge of place value;
- add combinations of whole numbers using the column method.

Note: It is important that children's mental methods of calculation are practiced and secured alongside their learning and use of an efficient written method for multiplication.

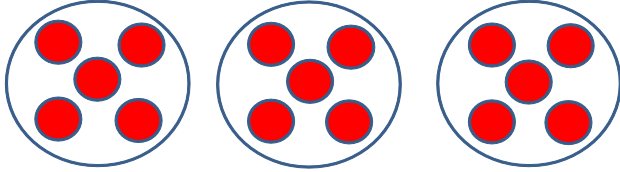
Using and Applying/Reasoning

Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measures).

Progression in Multiplication

Year 1

I can multiply by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

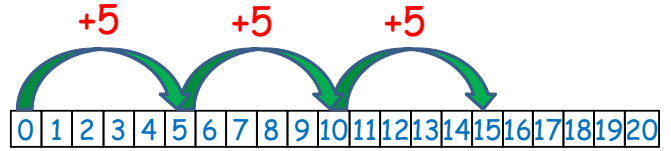


$$5 \times 3 = 5 + 5 + 5 = 15$$

"5 times 3" means "5, 3 times", which gives "3 lots of 5"!

Year 2

I can calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs.



$$3 \times 5 = 5 + 5 + 5$$

"3 lots of 5 = 15"

Year 3

I can write and calculate mathematical statements for multiplication using the multiplication tables that I know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.

	H	T	U
	3	5	
\times		3	
	<hr/>		
	1	0	5
	<hr/>		
	1		

	H	T	U
	6	7	
\times		5	
	<hr/>		
	3	3	5
	<hr/>		
	3		

Year 4

I can multiply two-digit and three-digit numbers by a one-digit number using formal written layout.

	Th	H	T	U
	6	5	8	
\times			3	
	<hr/>			
	1	9	7	4
	<hr/>			
	1	2		

	Th	H	T	U
	9	3	7	
\times			5	
	<hr/>			
	4	6	8	5
	<hr/>			
	1	3		

Year 5

I can multiply numbers up to 4 digits by a one or two digit number using a formal written method, including long multiplication for two digit numbers.

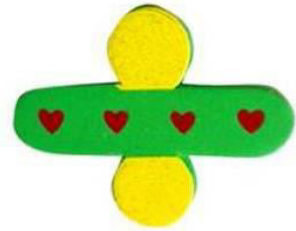
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\times			2	3	
	<hr/>				
	1	4	8	8	
$+$		2	1		
	<hr/>				
	9	9	2	0	
$=$		1	1		
	<hr/>				
	1	1	4	0	8
	<hr/>				
	1	1			

Year 6

I can multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

	Tt	Th	H	T	U
		3	4	9	6
\times				2	3
	<hr/>				
	1	0	4	8	8
$+$		1	2	1	
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	6	9	9	2	0
$=$		1	1		
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	8	0	4	0	8
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	1	1	1		

Division



Written methods for division of whole numbers

Our aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use efficient written methods accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and efficient written methods of calculation for division which they know they can rely on when mental methods are not appropriate. Our policy shows the stages in building up to long division in Year 6.

To divide successfully in their heads, children need to be able to:

- understand and use the vocabulary of division – for example in $18 \div 3 = 6$, the 18 is the dividend, the 3 is the divisor and the 6 is the quotient;
- partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways;
- recall multiplication and division facts to 10×10 , recognise multiples of one-digit numbers and divide multiples of 10 or 100 by a single-digit number using their knowledge of division facts and place value;
- know how to find a remainder working mentally – for example, find the remainder when 48 is divided by 5;
- understand and use multiplication and division as inverse operations.

Note: It is important that children's mental methods of calculation are practiced and secured alongside their learning and use of an efficient written method for division.

To carry out written methods of division successful, children also need to be able to:

- understand division as repeated subtraction;
- estimate how many times one number divides into another – for example, how many sixes there are in 47, or how many 23s there are in 92;
- multiply a two-digit number by a single-digit number mentally;
- subtract numbers using the column method.

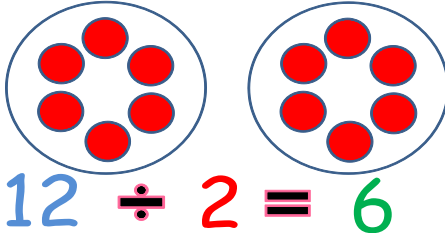
Using and Applying/Reasoning

Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measure).

Progression in Division

Year 1

I can divide by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

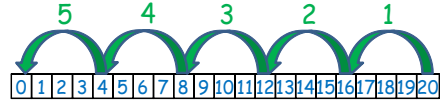


$$12 \div 2 = 6$$

"If I share 12 into 2 equal amounts, how many in each group?" Answer: 6

Year 2

I can calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals (=) signs.



$$20 \div 4 = 5$$

"20 divided by 4 = 5"

Year 3

I can divide a 2 digit number by a 1 digit number.

$$\begin{array}{r} \text{T U} \\ 23 \\ 3 \overline{) 69} \end{array} \quad \begin{array}{r} \text{T U} \\ 17 \\ 4 \overline{) 68} \end{array}$$

$$69 \div 3 = 23 \quad 68 \div 4 = 17$$

Year 4

I can divide a 3 digit number by a 1 digit number.

$$\begin{array}{r} \text{H T U} \\ 197 \\ 3 \overline{) 591} \end{array} \quad \begin{array}{r} \text{H T U} \\ 137 \\ 5 \overline{) 685} \end{array}$$

$$591 \div 3 = 197 \quad 685 \div 5 = 137$$

Year 5

I can divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.

$$\begin{array}{r} \text{Th H T U} \\ 1479 \text{ r}1 \\ 4 \overline{) 5917} \end{array} \quad \begin{array}{r} \text{Th H T U} \\ 0971 \text{ r}2 \\ 3 \overline{) 2915} \end{array}$$

$$5917 \div 4 = 1479 \text{ r}1 \quad 2915 \div 3 = 971 \text{ r}2$$

Year 6

I can divide numbers up to 4 digits by a two digit number and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.

$$\begin{array}{r} \text{Th H T U} \\ 0394 \text{ r}7 \\ 15 \overline{) 5917} \end{array}$$

$$5917 \div 15 = 394 \text{ r}7 = 394 \frac{7}{15}$$

Year 6

I can divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.

$$\begin{array}{r} \text{Th H T U} \\ 0175 \text{ r}11 \\ 14 \overline{) 2461} \\ \underline{-14} \\ 106 \\ \underline{-98} \\ 81 \\ \underline{-70} \\ 11 \end{array}$$

$$2461 \div 14 = 0175 \text{ r}11 = 0175 \frac{11}{14}$$