St Swithun's CE Primary School
Calculation Policy
Updated April 2016

Note:
During the transition year 2015-2016, the Inspire Maths programme is being introduced in Key Stage 1. This programme introduces formal written methods alongside conceptual understanding at an earlier stage than in previous years, therefore some steps identified here may be omitted or included according to the professional judgement of the teacher and their assessment of the children. In Key Stage 2 this calculation policy continues to be active.

In September 2016, Inspire Maths will also be implemented across Key Stage 2 and this policy will be reviewed to ensure it reflects current practise.

Introduction:

At St Swithun's, children are introduced to the processes of calculation through practical, oral and mental activities. As they begin to understand the underlying ideas, they develop ways of recording to support their thinking and calculation methods, so that they develop both **conceptual understanding** and **fluency** in the fundamentals of mathematics. Whilst interpreting signs and symbols involved with calculation, orally in the first instance, children use models and images to support their mental and written methods of calculation. As children's mental methods are strengthened and refined they begin to work more efficiently, which will support them with using succinct written calculation strategies as they are developed.

From Early Years to Year 1:

It is important for children to develop an early understanding of a range of fundamental skills as building blocks to future learning in maths, including those linked to calculation. A selection of the skills includes:

- Ordinality – 'the ordering of numbers in relation to one another' – e.g. (1, 2, 3, 4, 5…)

- Cardinality – 'understanding the value of different numbers' – e.g. (7 =   17 = +   12 =

- Equality – 'seven is the same total as four add three' – e.g. =

- Subitising – 'instantly recognizing the number of objects in a small group, without counting them' – e.g. → five

- Conservation of number – 'recognising that a value of objects are the same, even if they are laid out differently' – e.g.

- One-to-one correspondence – e.g.

- Counting on and back from any number – e.g. 'five add three more totals eight'   'ten take away three totals seven'

- Using apparatus and objects to represent and communicate thinking – e.g.

- Maths language – using mathematical words verbally in every-day situations – e.g. 'climb up to the top' / 'climb down to the bottom'

The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practise through progression in relevant practical maths experiences and visual representations.

By the end of Year 6, children will be equipped with efficient mental and written calculation methods, which they use with fluency. Decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. At whatever stage in their learning, and whatever method is being used, children's strategies must still be underpinned by a secure understanding and knowledge of number facts that can be recalled fluently.

The overall aims are that when children leave primary school they:
- are able to recall number facts with fluency, having developed conceptual understanding through being able to visualise key ideas – such as those related to place value - through experience with practical equipment and visual representations;
- make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads;
- have an efficient, reliable, written method of calculation for each number operation that they can apply with confidence when undertaking calculations that they cannot carry out mentally;
- are able to make connections between all four number operations, understanding how they relate to one another, as well as how the rules and laws of arithmetic can be applied.

This calculation policy has been structured by members of the Oxfordshire Primary Support Team and adapted for the use of the Big Maths and INSPIRE strategies we use at St Swithun's in conjunction with the statutory requirements as detailed in the 2014 National Curriculum for maths. Big Maths is being phased out and, from September 2016, will have been replaced from Years 1 to 6 by the INSPIRE programme. It has been set out to highlight general progression in calculation, which will allow pupils to develop conceptual understanding through continued use of practical equipment and visual representations.
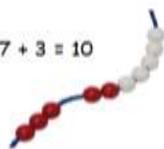
The policy has a correlation to year-by-year expectations set out in the National Curriculum programmes of study; with some additional steps.

Addition:

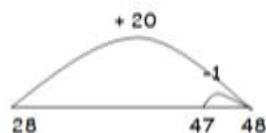Mental Calculation Strategies for Addition and Subtraction
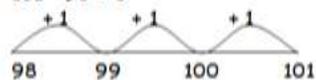
Number Bonds
$7 + 3 = 10$

Adjusting
$28 + 19 = 47$
$+ 20$
-1
28   47 48

Finding the Difference
$101 - 98 = 3$
$+1$ $+1$ $+1$
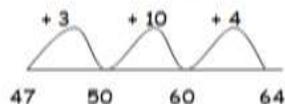98   99   100   101

Doubles

Bridging
$47 + 17 = 64$
$+ 3$ $+ 10$ $+ 4$
47   50   60   64

Near Doubles

Partitioning
$44 + 34 = 78$
$70 + 8 = 78$

Reordering
e.g. put big number in head when counting on
$6 + 13 = 19$
$13 + 6 = 19$

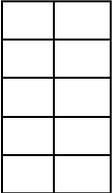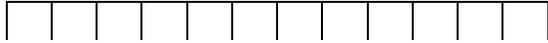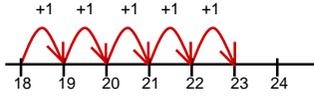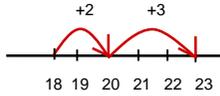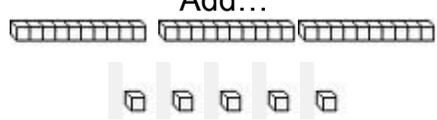|	Counting *(Counting)*	Mental maths strategies *(It's nothing new)*	Rapid recall *(Learn its)*	Written calculation and appropriate models and images to support conceptual understanding *(Calculation)*	
Stage 1:	*Saying numbers and reading numbers steps 1,2,3,4,5:* Count in ones to and across	*Fact families step 1:* Pupils use apparatus to explore addition as the	*Learn its step 4,5,6:* Rapid recall of all pairs of numbers totalling	*Addition steps 5-12* **Combining two groups:** Children develop a mental picture of the number system for use with calculation. A range of key models and	$3 + 2 = 5$

4

	100 forwards and backwards starting from 0, 1 and other numbers. *CORE numbers steps 1,2* *Count fourways: 1s,10s,2s,5s.* *Counting multiples step 1,2,3:* Count in multiples of two, five and ten.	inverse of subtraction. . 4 add 1 is 5 5 subtract 4 leaves 1 *Pim the alien step 1* *Doubling and halving steps 2,1,1* *Jigsaw numbers step 1*	numbers up to 20. Use structured apparatus – i.e. Numicon, tens frames, abaci, etc. 	images support this, alongside practical equipment. • Teachers model use of number tracks to count on or line up counters/objects along the number track. This is a precursor to use of a fully numbered number-line.	'eight add two more makes ten' 'one more than four is five'
	Counting *(Counting)*	**Mental maths strategies** *(It's nothing new)*	**Rapid recall** *(Learn its)*	**Written calculation and appropriate models and images to support conceptual understanding** *(Calculation)*	**Counting** *(Counting)*
Stage 2:	*Reading numbers step 6*	*Adding with Pim steps 1,2,3:*	*Learn its steps 7,8,9*	*Addition steps 12 – 24* **Counting on from any number:**	Number line with all numbers labelled
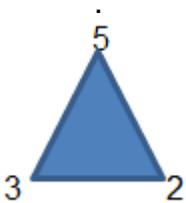
	CORE numbers step 3 Continue practising above skills. *Counting multiples step 4:* Count in steps of 2, 3 and 5 forwards and backwards to and from zero. Count in tens from any number – link to coins in a piggy bank as well as a number square. *Count Fourways: 20s, 200s, 2000s, 1/4s*	Reorder numbers when adding, i.e. start with largest number, find bonds, etc. *Jigsaw numbers step 2,3* *Doubling and halving to steps 3,3,3:* Add doubles and derive near doubles. Round numbers to the nearest 10. *X10 & ./.10 steps 1 and 1* *Coin multiplication steps 1,2* *Where's Mully step 1*	Recall addition facts for all numbers to 20.	• Children begin to use numbered lines to support their own calculations, initially counting in ones before beginning to work more efficiently. **Counting on from the largest number:** • Children reorder calculations to start with the largest number. *Column methods addition step 1*	0 1 2 3 4 5 6 7 8 9 10 11 12 18 + 5 …to… Use of questions such as: 'How might I rearrange these to find the total?'

	Counting *(Counting)*	Mental maths strategies *(It's nothing new)*	Rapid recall *(Learn its)*	Written calculation and appropriate models and images to support conceptual understanding *(Calculation)*	
		Fact families steps 2,3,4			
Stage 3:	*Reading numbers step 6:* Continue practising above skills. *Counting multiples step 6:* Count from 0 in multiples of 4, 8, 50 and 100. *CORE numbers step 4:* Count on by 10 or 100 from any two digit number. Link to counting stick: counting forwards and backwards flexibly.	*Pim the alien steps 2,3.* *Adding with Pim step 3. Doubling and halving to steps 5,5,3.* *Smile multiplication steps 1,2,3* *Coin multiplication step 3* *Where's Mully step 2* *Fact families step 5* Partitioning by bridging through 10 and multiples of 10 when adding.	*Learn its steps 10,11,12:* Connect pairs totalling ten to pairs of multiples of 10 totalling 100. Use 10ps in tens frame. Recall pairs of two-digit numbers with a total of 100, i.e. 32 + ? = 100.	*Addition steps 24 to 28* **Expanded horizontal addition:** • Add numbers using structured apparatus to support understanding of place value. • Make connections between partitioning both numbers using structured apparatus and partition the second number only using a number line. *Column method addition steps 2,3,4,5,6*	Add… …and… By partitioning and recombining 30+ 40 = 70 5 + 7 = 12 70 + 12 = 82 35 + 47 +30 +3 +2 47 77 80 82
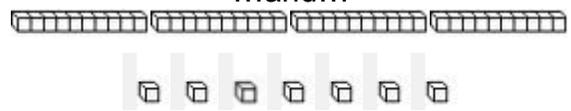
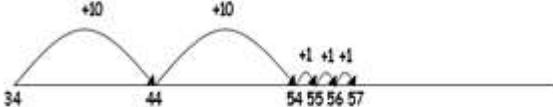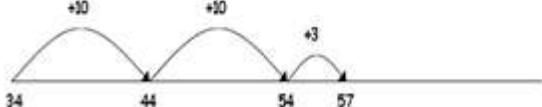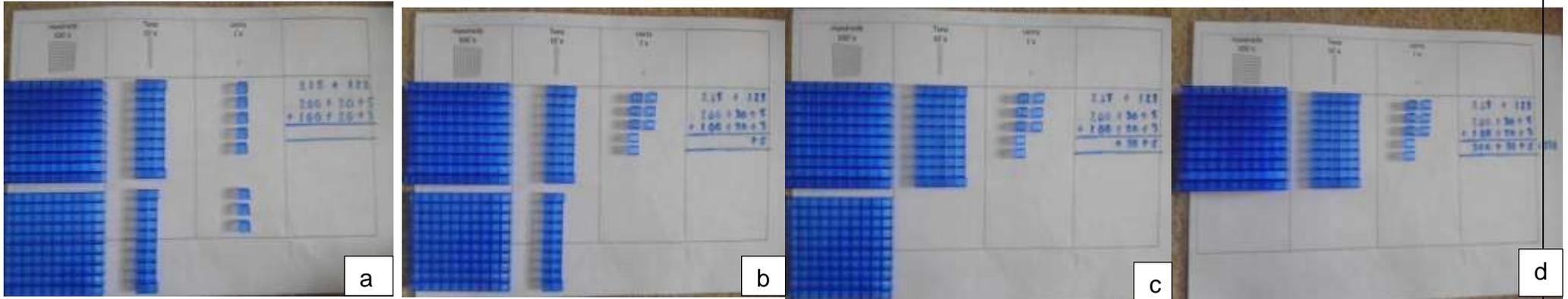|					
	Count Fourways 10ths, 0.1s: Count up and down in tenths – linking to visual image.	Adjusting when adding 11 or 9 to a number. *Jigsaw numbers step 3:* Relating inverse number operations – using structured apparatus to explore and understand that subtraction undoes addition.			
	Counting *(Counting)*	**Mental maths strategies** *(It's nothing new)*	**Rapid recall** *(Learn its)*	**Written calculation and appropriate models and images to support conceptual understanding** *(Calculation)*	
Stage 4:	*Reading numbers step 6* *Squigglesworth step 4* *CORE numbers step 7*	*Adding with Pim step 4:* Bridging through 60 for time, i.e. 70 minutes = 1 hour and 10 minutes. Rounding any number to the	*Learn its steps 13,14,15:* Use known facts and place value to derive new ones, i.e. 'If I know 8 + 3 = 11, I also know	*Addition steps 29 - 31* **Expanded horizontal method, leading to column addition:** • Written recording should follow teacher modelling around the size of numbers and place value using a variety of concrete materials, e.g. straws, Numicon, Dienes and place-value cards.	It is crucial that empty number lines are kept as well as using more formal written calculation methods.

	Count fourways 1/5s *Counting along step 4* Continue practising previous skills. Count forwards and backwards from 0 in multiples of 6, 7, 9, 25 and 1000 using counting sticks, number lines, number squares, etc. Count up and down in tenths, hundredths and simple fractions using models and images, i.e. Dienes equipment, counting stick, ITPs.	nearest 10, 100 or 1000. Rounding numbers with one decimal place to nearest whole number. *Jigsaw numbers step 4:* Explore inverse as a way to derive new facts and to check accuracy of answers. *Smile multiplication step 3* *Coin multiplication step 4* *Where's Mully step 3* *Pom's words steps 1,2*	0.8 + 0.3 = 1.1 and 8/100 + 3/100 = 11/100.' Sums and differences of pairs of multiples of 10, 100 or 1000. Addition doubles of numbers to 100. Pairs of fractions totalling 1.	• Teachers model how numbers can be partitioned into tens and ones, as well as in different ways, e.g. 20 + 5 10 + 15 • As children move towards using a column method, links continue to be made with earlier models and images, including the number line. *Column method addition steps 7,8*	Counting on in tens and ones to solve an addition calculation: 34 + 23 = 57 Counting on more efficiently: 34 + 23 = 57

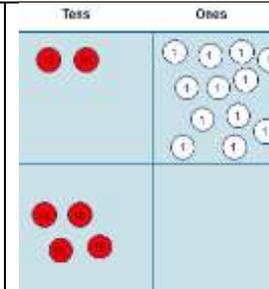|				Illustration of how to use Dienes equipment to ensure children have an understanding of place value when using column addition.

a   b   c   d

	Counting *(Counting)*	Mental maths strategies *(It's nothing new)*	Rapid recall *(Learn its)*	Written calculation and appropriate models and images to support conceptual understanding *(Calculation)*	
Stage 5:	*Squiggleworth step 5* *CORE numbers steps 8,9* *Count Fourways -25s* *Counting along step 6* Count forwards and backwards in steps of powers of 10 for any given	Use apparatus and knowledge of place value to add decimals, i.e. 3.8 + 2.5 = 5 + 1.3 Reorder increasingly complex calculations, i.e. 1.7 + 2.8 + 0.3 = 1.7 + 0.3 + 2.8 Compensating – i.e. 405 + 399 → add 400 and then subtract 1.	Continue to practise previous stage and make links between known facts and addition pairs for fractions, percentages and decimals Doubles and halves of decimals, i.e. half of 5.6, double 3.4.	*Addition steps 32 -38* **Expanded vertical method, leading to column addition:** • Teachers model a column method that records and explains partial mental methods. • There remains an emphasis on the language of calculation, e.g. 'Forty plus seventy equals one-hundred and ten.'… 'Seven add six equals thirteen.' …before recombining numbers. Teachers also model the language of: 'Four tens add seven tens total eleven tens or 110.' • Teachers similarly advance to model the addition of two 3-digit	Informal column: Adding the tens first: $$\begin{array}{r} 47 \\ +\ 76 \\ \hline 110 \\ 13 \\ \hline 123 \end{array}$$ Adding the ones first:

10

	number up to one million. Continue to count forwards and backwards in simple fractions. Count forward and backwards in appropriate decimals and percentages.	*X10 & ./.10 steps 5 and 5* *Pom's words step 3,4*	Sums and differences of decimals, i.e. 6.5 + 2.7	numbers with the expectation that as children's knowledge of place value is secured, they become ready to approach a formal compact method. *Addition column method steps 9,10*	47 + 76 13 110 123
Stage 6:	Continue to practise previous skills. Count forwards and backwards in simple fractions, decimals and percentages. *CORE numbers step 10* *Counting along step 7*	Bridging through decimals, i.e. 0.8 + 0.35 = 0.8 + 0.2 + 0.15 using empty number lines. Partitioning using near doubles, i.e. 2.5 + 2.6 = 5 + 0.1 Reorder decimals, i.e. 4.7 + 5.6 – 0.7 …as… 4.7 – 0.7 + 5.6 = 4 + 5.6.	Ensure all children are confident recalling basic facts to 20 and deriving facts using place value. Make links between decimals, fractions and percentages.	*Addition steps 39 -41* **Column addition (formal written method):** • The concept of exchange is introduced through continued use of practical equipment (manipulatives). • Teachers model: 1. "I have two tens and five ones, which need adding to four tens and seven ones." 2. "I add five ones to seven ones, which gives me twelve ones." 3. "I exchange ten of my twelve ones for a ten counter." 4. "I add my three tens and four tens to make seven tens." "Altogether, I have seven tens and two ones."	**Pupils to be encouraged to consider mental strategies first.** Formal column: 25 +47 25 +47 2 1
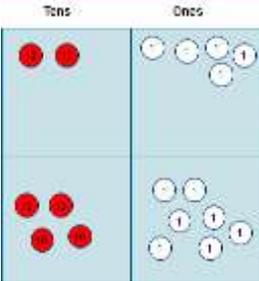
- Teachers similarly advance to model the addition of two 3-digit numbers, e.g.

$$587$$
$$+\ 475$$
$$\overline{1062}$$
$$\small 1\ 1$$

Addition column method steps 11,12,13,14
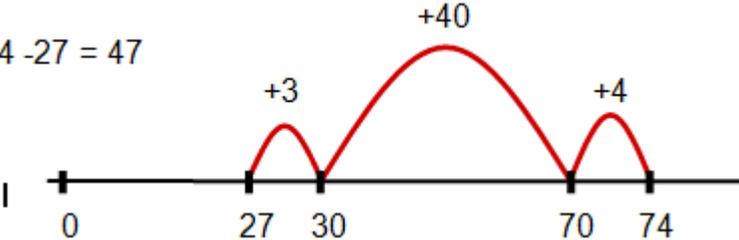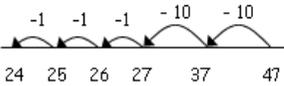

25
+47
  2
1

25
+47
 72

1

12
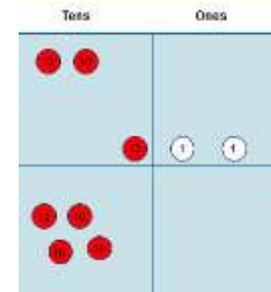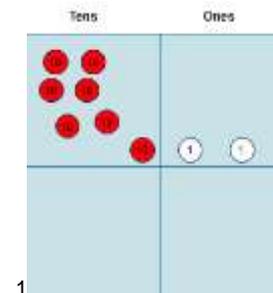
Subtraction:

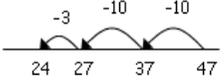|	Counting	Mental strategies	Rapid Recall	Written calculation and appropriate models and images to support conceptual understanding	
Stage 1:	*Saying numbers and reading numbers steps 1,2,3,4,5:* Count in ones to and across 100, forwards and backwards starting from 0, 1 and other numbers. *CORE numbers steps 1,2* *Count fourways: 1s,10s,2s,5s.* *Counting multiples step 1,2,3:* Count in multiples of two, five and ten.	*Fact families step 1:* Pupils use apparatus to explore addition as the inverse of subtraction: 'four add one is five.' 'five subtract four leaves one' *Pim the alien step 1* *Doubling and halving steps 2,1,1*	*Learn its step 4,5,6:* Rapid recall of subtraction facts for numbers up to 10. Use structured apparatus, i.e. Numicon, tens frames, abaci etc.	*Subtraction steps 5-12* **Subtraction as taking away from a group:** • Children develop a mental picture of the number system for use with calculation. A range of key models and images support this, alongside practical equipment. • Teachers model use of number tracks to count back or remove counters/objects from the number track or set. This is a precursor to use of a fully numbered number-line.	5 - 2 = 3 'six take away two leaves four' 'one less than six is five'
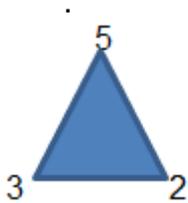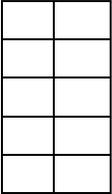
		Jigsaw numbers step 1			
Stage 2:	*Reading numbers step 5, 6:* Continue practising above skills. Count in steps of 2, 3 and 5, forwards and backwards to and from zero. Count in tens from any number – link to coins in a piggy bank as well as a number square. *Squiggleworth step 1* *CORE number step 2 and 3*	*Adding with Pim step 2 and 3:* Bridging through two digit numbers, i.e. 24 – 19 = 19 + 1 + 4 using number lines. Subtracting 11 by subtracting 10 and then 1 more. Move to subtracting 9 by subtracting 10 and adding 1 using apparatus. *Doubling and halving to steps 3,3,3* *Jigsaw numbers step 3* *X10/10 steps 1 and 1* *Coin multiplication step 1 and 2*	*Learn its schedule 7,8,9:* Recall subtraction (and addition) facts for all numbers to 20.	*Subtraction steps 13-24* **Subtracting by counting back and on:** • Children begin to use numbered lines to support their own calculations, initially counting back in ones before beginning to work more efficiently. *Subtraction column method step 1*	Number line with all numbers labelled 0 1 2 3 4 5 6 7 8 9 10 11 12 13 – 5 = 8 -1 -1 -1 -1 -1 8 9 10 11 12 13 13 – 5 = 8 -2 -3 8 9 10 11 12 13

14

	Counting multiples step 3 and 4 *Count fourways 20s, 200s, 2000s, 1/4s* *Counting along step 1*	*Where's Mully step 1* *Fact families steps 2, 3 and 4*			
Stage 3:	*Reading numbers step 6:* Continue practising above skills. *Counting multiples step 4,5,6:* Count from 0 in multiples of 4, 8, 50 and 100. Count on and back by 10 or 100 from any two digit number. Link to counting stick counting forwards and	*Smile multiplication step 1,2,3:* Partitioning by bridging through 10 and multiples of 10 when subtracting. Continue to practise adjusting when subtracting 11 or 9 from a number. *Fact families step 5:* Relating inverse number operations – use structured apparatus to explore and understand that subtraction undoes addition.	*Learn its schedule 10, 11, 12:* Connect subtractions from ten to subtractions from multiples of 10 totalling 100. Use 10ps in tens frame. Subtract two digit numbers	*Subtraction steps 24 - 29* **Finding the difference:** • Teachers model how to find the difference when two numbers are relatively 'close together.' • Initially children compare two sets before moving on to a number line comparison. • **Pupils are taught to choose whether to count on or back** depending	Comparing two sets: comparison or difference. Finding the difference on a number line. Note: Finding the difference is often the most efficient way of solving a subtraction problem, e.g. 61 – 59 2,003 – 1,997

	backwards flexibly. *Count Fourways step 1/10ths, 0.1s:* Count up and down in tenths – linking to visual image. *Sqiggleworth steps 2 and 3* *CORE numbers step 4*	*Pim the alien step 2 and 3* *Doubling and halving to steps 5,5,3* *Jigsaw numbers to step 3* *Coin multiplication step 3* *Where's Mully step 2*	from 100 i.e. ? = 100 - 78	on which is more efficient. *Subtraction column method step 2-5*	
Stage 4:	*Reading numbers step 6:* Continue practising of previous skills. *Counting multiples step steps 7,8,9:* Count forwards and backwards from 0 in multiples of 6, 7, 9, 25 and 1000 using counting	Bridging through 60 for time, i.e. 70 minutes = 1 hour and 10 minutes Rounding any number to the nearest 10, 100 or 1000. Rounding numbers with one decimal place to nearest whole number. Explore inverse as a way to derive new facts and to	*Learn its schedule steps 13, 14 and 15:* As above. Use known facts and place value to derive new ones, i.e. 'If I know 11 - 3 = 8, I also know 1.1 - 0.3 = 0.8 and 8/100 -	*Subtraction steps 29, 30* **Subtracting TU – U and TU – TU:** *Subtraction column method steps 6, 7*	Use empty number lines to find the difference by bridging through multiples of ten. Subtract by starting with the first number and partitioning the second, i.e. 74 - 27 74 – 20 = 54 54 – 4 = 50 50 – 3 = 47

	sticks, number lines, number squares, etc. *Counting along steps 3 and 4* *CORE numbers step 5, 6 and 7* *Count Fourways 25s, 250s, 2500s, 0.2s, 0.5s, 0.25s, 1/5s* Count up and down in tenths, hundredths and simple fractions using models and images, i.e. Dienes equipment, counting stick, ITPs.	check accuracy of answers. *Doubling and halving step-,-,5 then 6.* *Jigsaw numbers step 4* *Pom's words step 1,2* *Where's Mully step 3* *Coin multiplication step 4*	3/100 = 5/100.' Sums and differences of pairs of multiples of 10, 100 or 1000. Subtraction of fractions totalling 1, i.e. 1 – 0.3 = 0.7	
Stage 5:	*Reading numbers step 7,8,9:*	Use apparatus and knowledge of place value to	Continue to practise previous stage and	*Subtraction steps 31 – 38*	Children should continue to use empty number lines and use more formal written methods when numbers become too big or complex.

Count forwards and backwards in steps of powers of 10 for any given number up to one million. Continue to count forwards and backwards in simple fractions. Count forward and backwards in appropriate decimals and percentages.	subtract decimals, i.e. 3.8 - 2.5 = 1.3 Reorder increasingly complex calculations, i.e. 1.7 – 5 – 0.7 = 1.7 – 0.7 – 5. Compensating – i.e. 405 - 399 → subtract 400 and then add 1.	make links between known facts and addition pairs for fractions, percentages and decimals. Doubles and halves of decimals, i.e. half of 5.6, double 3.4. Sums and differences of decimals, i.e. 6.5 + 2.7	**First stage of column method, including expanded method:** • Written recording should follow teacher modelling around the size of numbers and place value using a variety of concrete materials, e.g. straws, Numicon, Dienes and place-value cards.	Counting back in tens and ones to solve an addition calculation: Counting back more efficiently:
CORE numbers steps 7, 8 and 9 *Squiggleworth step 5* *Count Fourways -1s, -2s, -5s, -25s* *Counting along step 4,5,6*	*Jigsaw numbers step 5* *X10, /10 steps 3,3 to 5,5* *Smile multiplication steps 4 and 5* *Coin multiplication step 5* *Where's Mully steps 4 and 5* *Pom's words step 2,3,4*		*Subtraction column method step 8*	

$363 - 147 = 216$

$$\begin{array}{r} 50 \;\; 13 \\ 300 + 60 + 3 \\ 100 + 40 + 7 \\ \hline 200 + 10 + 6 = 216 \end{array}$$

Illustration of how to use Dienes equipment to ensure children understand transference of numbers when using column subtraction.

a

b

c

d

| Stage 6: | *CORE numbers step 10:* Continue to practise previous skills.

Counting along step 7 Count forwards and backwards in simple fractions, | Bridging through decimals, i.e. 1.5 – 0.8 = 1.5 – 0.5 then -0.3 using empty number line.

d | Ensure all children are confident recalling basic facts to 20 and deriving using place value. Make links between decimals, fractions and percentages. | *Subtraction steps 37*

Subtraction column method steps 9,10,11,12

Second stage of column method:
The concept of exchange is introduced through continued use of practical | Formal column:

$\begin{array}{r} 7\,2 \\ -\,4\,7 \\ \hline \end{array}$

Tens · Ones

$\begin{array}{r} \overset{6}{7}\,{}^{1}2 \\ -\,4\,7 \\ \hline \end{array}$ |

19

				decimals and percentages.	equipment (manipulatives).	

			equipment (manipulatives).	
			• Teachers model:	
			1. "I have seven tens and two ones. I need to subtract four tens and seven ones."	
			2. "At the moment, I cannot subtract seven ones from two ones, so I need to transfer one ten to become ten ones."	
			3. "Now I can take away seven ones from twelve ones, so that I have fives ones left.	
			4. "I can now subtract four tens from six tens, which leaves me with two tens."	
			5. "I recombine two tens and fives ones to understand that I am left with twenty-five."	
			• Teachers similarly advance to model the subtraction of one 3-digit number from another, e.g.	

				5 1
				5̸6̸3
				246
				317
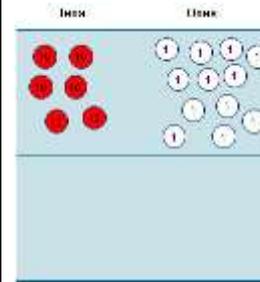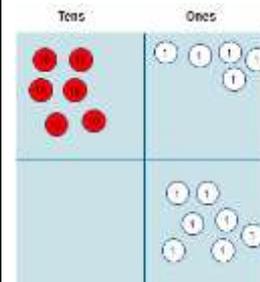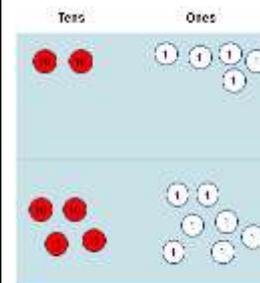
Multiplication:

Mental Calculation Strategies for Multiplication and Division

Knowing multiplication and division facts to 12 X 12
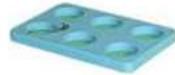
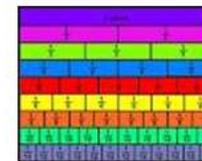Multiplying and dividing by multiples of 10

Doubling and halving
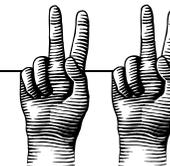
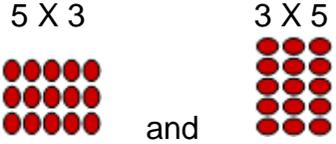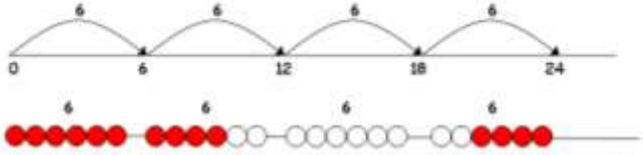Multiplying and dividing by single-digit numbers and multiplying by two-digit numbers

10 X 3   7 X 3

17 X 3
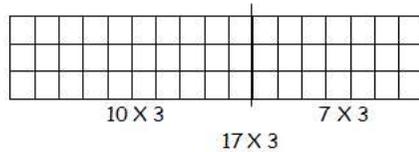
Finding fractions, decimals and percentages
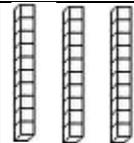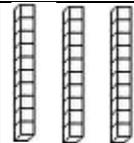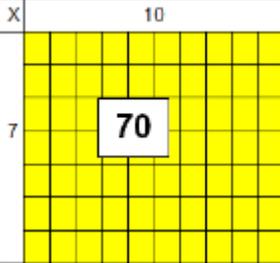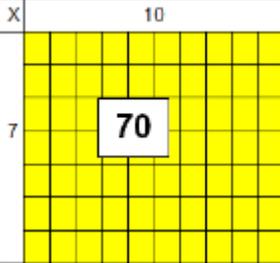
	Counting	Mental strategies	Rapid recall	Written calculation and appropriate models and images to support conceptual understanding	
Stage 1:	*Counting multiples step 2 and 3:* Count	*Doubling and halving steps 2,1,1:* Doubling up to six and then ten whilst using related models and images.	*Learn its steps 4,5,6:* Derive/recall doubles up	*Multiplication steps 3,4,5,6*	Use objects, pictorial representations and arrays to show the concept of multiplication:

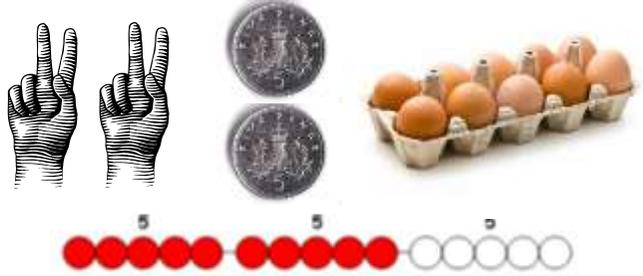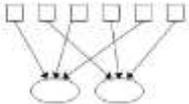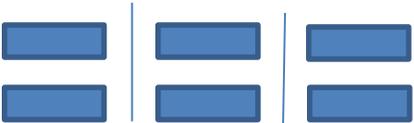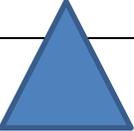|					
	forwards and backwards in 2s, 5s and 10s	*Jigsaw numbers step 1* *Pim the alien step 1* *Fact families step 1*	to five and derive/recall halves up to ten. Recall odd and even numbers to 10 in reference to structured apparatus. 	**Developing early conceptual understanding of multiplication:**	
Stage 2:	*Counting multiples steps 3 and 4:* Count forwards and backwards in 2s, 3s, 5s and 10s from zero. *CORE numbers steps 2 and 3* *Count Fourways: 100s*	*Fact Families step 2,3, and 4:* Begin to understand and use inverse number operations: 10 2 5 Stories are used alongside a triad to help children understand links between number operations, e.g. "There are five pencils in two packs, which	*Learn its schedule 7,8,9:* Derive/recall doubles up to ten and derive/recall halves up to twenty. Recall odd and even numbers to 20 in reference to structured apparatus.	**Understanding multiplication as repeated addition:** • Investigate multiplication as repeated addition, so that the law of commutativity is understood. • Whilst arrays are also modelled explicitly at this stage, it is important to	Arrays: 5 X 3 3 X 5 and Number lines: 6 X 4 = 24 So: 'Six taken four times"
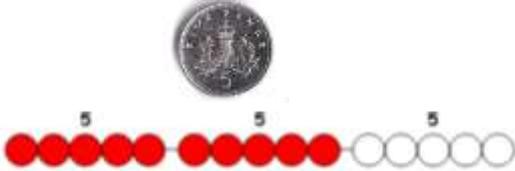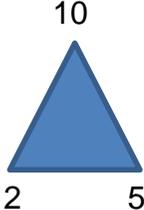
22

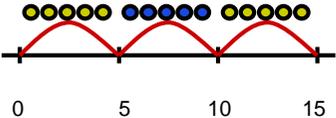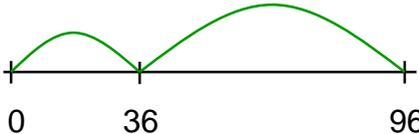|		means that there are ten pencils altogether."	Recall & use multiplication facts for the 2X, 5X and 10X-tables.	note that they will continue to be a key model at later stages, alongside more formal methods of calculation. *Multiplication steps 7, 8, 9*	
Stage 3:	*Counting multiples step 4,5,6:* Counting forwards and backwards in 2s, 3s, 4s, 5s, 8s and 10s from zero. Count up and down in tenths.	*Pim the Alien step 1,2,3* *Doubling and halving steps 3,3,3 to 5,5,3:* Use doubling to make connections between the 2X, 4X and 8X-tables. *Smile multiplication step 1,2,3:* Understand that multiplication can be undertaken by partitioning numbers, e.g. 12 X 4 = 10 X 4 + 2 X 4 *Coin multiplication step 2,3:* Introduce the structure of scaling: e.g. Find a ribbon that is 4 times as long as the blue ribbon 2cm 8cm *Where's Mully? steps 1 and 2*	*Learn its schedule: 10, 11, 12:* Recall odd and even numbers to 100 in reference to structured apparatus. Recall and use multiplication facts for the 2X, 3X, 4X, 5X, 8X and 10X tables.	*Multiplication steps 9, 10 11* **Relate multiplying a 2-digit by 1-digit number using repeated addition and arrays to represent:** *Multiplication column methods step 1*	Children use an empty number line to chunk efficiently: 4 X 12 = 48 4 X 10 = 40 4 X 2 = 8 0 4 8 12 16 20 24 28 32 36 40 44 48 3 X 13 = 39 | X	10	3
3			 7 X 13 = 91 X 10 3 7 70 21

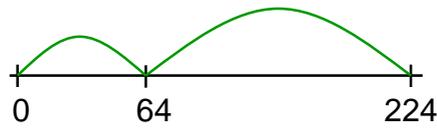|					
		X10 & /10 step 1,1			
Stage 4:	*Counting multiples steps 7, 8, and 9:* Counting forwards and backwards in 2s, 3s, 4s, 5s, 7s, 8s, 10s, 25s and 1000s from zero. *Count Fourways25s, 250s, 2500s, 0.2s, 0.5s, 0.25s 1/5s* Count up and down in tenths and hundredths.	*Pom's words step 1 and 2:* Derive factor pairs of numbers using models and images, e.g. *X10/10 step 2,1, and 2,2:* Know what happens when a number is multiplied by zero or one. Use reordering to multiply three numbers. *Jigsaw numbers step 4* *Doubling and halving steps- - 3 to - - 6* *Coin multiplication step 3, 4*	*Learn its schedule: 13, 14, 15:* Recall & use multiplication facts for all times-tables up to 12 X 12.	*Multiplication steps 12, 13, 14:* **Relate multiplying a 3/2-digit by 1-digit number with arrays towards using long/short multiplication:** *Column multiplication step 1,2,3*	Relate multiplying a 3/2-digit by 1-digit number, now also setting it out as short multiplication. 7 X 13 = 91 7 X 10 = 70 7 X 3 = 21 　　　 = 91 At this stage, the **non-statutory** guidance in the national curriculum suggests teaching short multiplication; however, the team feel that an expanded form of calculation (as set out above) is be a better lead into long/short multiplication.
Stage 5:	Counting forwards and backwards in 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 25s and 1000s from zero.	*Pom's words step 2,3,4:* Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. *Smile multiplication steps 4 and 5*	Recall & use multiplication facts for all times-tables up to 12 X 12.	*Multiplication steps 14, 15, 16* **Relate multiplying a 4/3/2-digit by 1/2-digit number with grid to**	18 X13
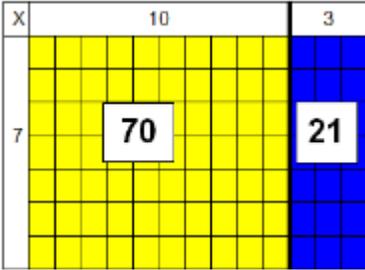
	Count Fourways: -1s,-2s, -5s, -25s,	*Coin multiplication steps 4 and 5* *Where's Mully? Steps 4 and 5* *Jigsaw numbers step 5* *X10 & /10 steps 3,3 to 5,5*		**using long multiplication:** *Multiplication column methods steps 4,5,6*	24 30 80 100 234
Stage 6:	*CORE numbers step 10:* Consolidate all previous counting, including forwards and backwards in fractions. *Counting along step 7*	Perform mental calculations, including with mixed numbers and operations.	Recall & use multiplication facts for all times-tables up to 12 X 12. In addition, use facts confidently to make larger calculations.	*Multiplication steps 17 and 18* **Relate multiplying a 4/3/2-digit by 1/2-digit number with grid to using short multiplication:** *Multiplication column methods steps 7,8,9,10,11*	18 X13 54 ² 180 234

Division:

	Counting	Mental strategies	Rapid recall	Written calculation and appropriate models and images to support conceptual understanding	
Stage 1:	*Counting multiples step 2 and 3:* Count forwards and backwards in 2s, 5s and 10s *CORE numbers step 2*	*Pim the alien step 1* *Doubling and halving steps 2,1,1* Doubling up to six and then ten whilst using related models and images. *Jigsaw numbers step 1* *Fact families step 1*	*Learn its schedule 4,5,6:* Derive/recall doubles up to five and derive/recall halves up to ten. Recall odd and even numbers to 10 in reference to structured apparatus.	*Division steps 5 to 11* **Developing early conceptual understanding of division as grouping and sharing:**	Use objects, pictorial representations and arrays to show the concept of division as grouping and sharing. "Two children share six pencils between them" "Six children are asked to get into three equal groups"
Stage 2:	*Counting multiples steps 3,4:* Count forwards and backwards in 2s, 3s, 5s	*Fact families steps 2,3,4:* Begin to understand and use inverse number operations. 15	*Learn its schedule 7,8,9:* Derive/recall doubles up to ten and derive/recall	*Division steps 12 to 17* **Understanding division as repeated subtraction:**	Number lines and arrays: $12 \div 3 = 4$

and 10s from zero. *Count Fourways: 100s 50s, 500s, 5000s, 1/2s 20s, 200s, 2000s, 1/4s*	3 5 ●●●●● Stories are used alongside a triad to help children understand links between number operations, e.g. "15 children are asked to get into three groups and find out that there are five people in each group." *Doubling and halving 3,2,2 to 3,3,3* *Coin multiplication steps 1 and 2* *X10 & /10 steps 1,1*	halves up to twenty. Recall odd and even numbers to 20 in reference to structured apparatus. Recall and use multiplication facts for the 2X, 5X and 10X-tables.	• Investigate division as repeated subtraction. • Through teacher modelling, children need to know that division is not commutative.	$15 \div 5 = 3$
Stage 3:	*Counting multiples steps 4,5,6:* Counting forwards and backwards in 2s, 3s, 4s, 5s, 8s and 10s from zero.	*Doubling and halving 3,3,3 to 5,5,3:* Use doubling to make connections between the 2X, 4X and 8X-tables. Understand that multiplication can be undertaken by partitioning numbers, e.g. 12 X 4 = 10 X 4 + 2 X 4 *Coin multiplication steps 2 and 3:* Introduce the structure of scaling: e.g. Find a ribbon that is 4 times as long as	*Learn its schedule steps 10, 11, 12:* Recall odd and even numbers to 100 in reference to structured apparatus. Recall & use multiplication facts for the	*Division steps 17 to 19* **Dividing a 2-digit by 1-digit number, representing this efficiently on a number line:** *Division column method step 1*	Children use an empty number line to chunk efficiently. $96 \div 6 = 16$ 6 x 6 = 36 10 x 6 = 60

| | the blue ribbon. 2cm   8cm *Fact families steps 4 and 5* | 2X, 3X, 4X, 5X, 8X and 10X tables. | | | |

Stage 4:	*CORE numbers steps 5,6,7* *Counting multiples steps 7, 8, 9:* Counting forwards and backwards in 2s, 3s, 4s, 5s, 7s, 8s, 10s, 25s and 1000s from zero. *Count Fourways: 25s, 250s, 2500s, 0.2s, 0.5s, 0.25s, 1/5s*	*Pom's words steps 1 and 2:* Derive factor pairs of numbers using models and images. *X10 & /10 step 2,1 to 2,2:* Know what happens when a number is multiplied by zero or one. *Jigsaw numbers step 4* *Where's Mully steps 2 and 3* Use reordering to multiply three numbers.	*Learn its schedule 13, 14, 15:* Recall & use multiplication facts for all times-tables up to 12 X 12.	*Division steps 19 to 23* **Dividing a 3/2-digit by 1-digit number, representing this efficiently on a number line, also in relation to long division:** At this stage, no remainders are present unless in a practical context. *Division column method steps 2,3,4*	Children use an empty number line to chunk efficiently. $224 \div 8 = 28$ $8 \times 8 = 64$ $20 \times 8 = 160$ 0 64 224 28 8 ⟌ 224 - 160 (8 X 20) 64 - 64 (8 X 8) 0 …or… 28 8 ⟌ 224 20 X 8 = 160 64 8 X 8 = 64 0
Stage 5:	Counting forwards and backwards in 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s,	*Pom's words steps 2,3,4:* Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.	Recall & use multiplication facts for all times-tables up to 12 X 12.	*Division steps 24 to 31* **Dividing a 4/3/2-digit by 1-digit number, in relation to long division:**	As schools have autonomy to decide children's progression in learning between long and short division in Years 5 and 6, the maths team suggest beginning with long division. Remainders should be interpreted in the following ways when long division is used:

28

	10s, 25s and 1000s from zero. *Count Fourways: -1s,-2s, -5s, -25s,*	*X10 & /10 step 3,3 to 5,5* *Jigsaw numbers step 5* *Smile multiplication step 4 and 5* *Coin multiplication step 5* *Where's Mully steps 4 and 5*		• By this stage, there is a statutory requirement that children can use a formal written calculation method, such as long division. • Short division may begin to be taught alongside long division, but still with use of visual representations *Division column methods step 5, 6 and 7*	• as whole numbers • as fractions • through rounding in an appropriate way to the context Long division: $415 \div 9 = 46$ and $1/9$ $$\begin{array}{r} 46 \text{ and } 1/9 \\ 9\,\overline{)\,415} \\ -\ 360 \quad (9 \times 40) \\ \overline{55} \\ -\ 54 \quad (9 \times 6) \\ \overline{1} \end{array}$$
Stage 6:	*CORE numbers step 10:* Consolidate all previous counting, including forwards and backwards in fractions.	Perform mental calculations, including with mixed numbers and different number operations.	Recall & use multiplication facts for all times-tables up to 12 X 12. In addition, use facts confidently to make	*Division steps 32 and 33* **Dividing a 4/3/2-digit by 2/1-digit number, in relation to long and then short division:** • By this stage, there is a statutory requirement	As schools have autonomy to decide children's progression in learning between long and short division in Years 5 and 6, the maths team suggest moving from long division to short division. Remainders should be interpreted in the following way when short division is used: • through rounding in an appropriate way to the context Long division: $432 \div 15 = 28\ 4/5$

			larger calculations.	that children can use formal written calculation methods, including long and short division. • Use of visual representations – like the ones opposite – remain important. *Division column methods steps 7, 8, 9, 10, 11*	
	Counting Along step 7				

Long division:

```
          2   8
  1  5 | 4   3   2
     -  3   0   0    15×20
        1   3   2
     -  1   2   0    15×8
            1   2
```

$\frac{12}{15} = \frac{4}{5}$

Answer: $28\frac{4}{5}$

Short division:
$138 \div 6 = 23$

Date approved by governors	April 2016
Date for review	Summer 2017 then three-yearly