St Mary's CE Primary School
Felsham Road
Putney

Calculation Policy for Mathematics

At St. Mary's we aim to provide a high quality education to enable every child to reach their full potential within an inclusive and nurturing Christian community

March 2015

Introduction

This calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics. It is designed to give pupils a consistent and smooth progression of learning in calculations across the school. It will help to ensure the development of mathematical fluency, reasoning and problem solving. At the Early Years Foundation Stage (EYFS) the calculations taught in mathematics follows guidance taken from both the *Statutory Framework for the Early Years Foundation Stage* and the *Development Matters in Early Years Foundation Stage* documents. At Key Stage 1 and Key Stage 2 the calculations taught follows guidance taken from the *Mathematics Programmes of Study: Key Stages 1 and 2* document and is largely based upon the content, strategies and methods derived from the teaching and learning of the *Abacus* scheme of work.

Number operations

The calculation policy outlines the school's mental strategies and written methods (sometimes known as pencil and paper methods) for the four number operations:

- addition
- subtraction
- multiplication
- division

Providing a context

It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation and to help them recognise when to use certain operations and methods when faced with problems.

Choosing a calculation method

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved:

- Can I do it in my head using a mental strategy?
- Could I use some jottings or drawings or representations to help me?
- Should I use a written method to work it out?

Progression in calculation methods

This calculation policy is organised according to the age stage expectations as set out in the National Curriculum 2014 and *Abacus* scheme of work. At St. Mary's the expectation is that the majority of pupils will move through the calculation policy at broadly the same pace. Although each method will be taught in the year group specified, children should not be discouraged from using previously taught methods with which they are secure, while the new concepts are becoming embedded. Children who grasp these methods and concepts rapidly should be challenged through being offered diverse and sophisticated problems rather than being accelerated through new content. This will ensure the fluency of the calculation methods and concepts being taught. It is fundamental for children to move from conceptual learning to abstract learning in order to be able to successfully understand, use and apply their mathematical skills. Procedural learning of methods should be avoided.

Representations

Key to successful implementation of a school calculation policy is consistent use of representations (models and images that support the conceptual understanding of the mathematics). Mathematical understanding is developed through the use of representations that are first of all concrete (e.g. Multilink cubes, bead strings, Base-10, Numicon, Dienes apparatus etc.), and then pictorial (e.g. array, number lines, place value counters etc.) to then facilitate abstract working (e.g. column addition and subtraction, long multiplication etc.). The ideology of moving from concrete to pictorial and then to abstract recording is known as CPA.

Vocabulary

Misconceptions will occur and therefore need to be rectified immediately. It is necessary to use clear, unambiguous language to minimise misconceptions and this should be consistent across the whole school. It is important to tell children they are performing calculations and not sums. Sum means addition. When using column methods for subtraction the children should be told to 'exchange' a ten for ones, or a hundred for tens, and not to 'borrow' a ten or hundred. When teaching multiplication and division by 10, 100 and 1000 it is the figures that move and not the decimal point. The decimal point always resides between the ones and the tenths. When multiplying an integer by 10 we do not add a 0. Adding implies addition and the addition of a number and a zero means the original number remains unchanged. Explain that the digits move left and a zero is required as a place holder. A useful glossary of the key mathematical vocabulary to be used has been provided (see Appendix A).

Parental support with calculations

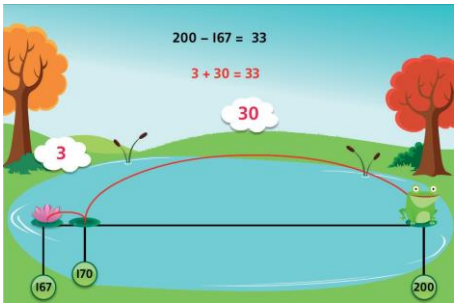
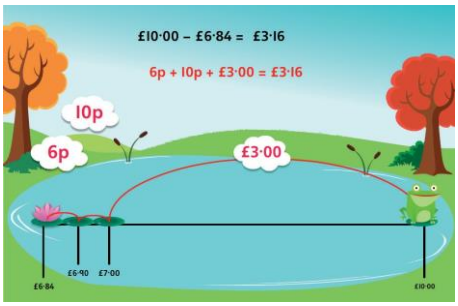
It is important that parents and carers are familiar with the school's Calculation Policy for Mathematics so that they can support children at home with tasks such as their maths homework. This policy will be available to view on the school's website. A booklet produced by the school that outlines the calculations taught is currently being produced as a handy reference guide for both pupils and parents.

Parents can help their children improve calculation skills through a wide range of activities and below are some suggestions:

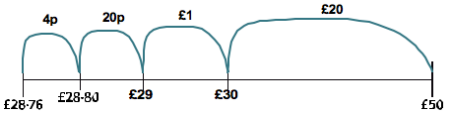
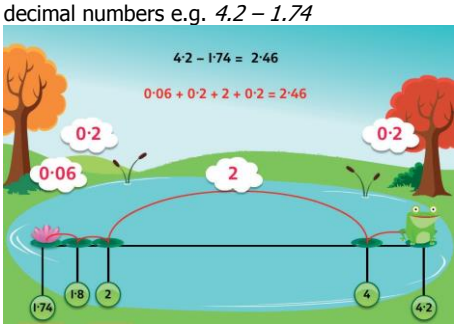
- Counting with their child
- Playing number games
- Involving children when taking measurements or weighing items
- Taking note of numbers in real life e.g. telephone numbers, bus numbers, serial numbers etc.
- Giving children opportunities to use money to shop, check change etc.
- Talking about the mathematics in football e.g. 'How many points does your favourite team need to catch the next team in the league?'
- When helping their children calculate try to use the method that their child has been taught in school by referring to this calculation policy

EARLY YEARS FOUNDATION STAGE (EYFS)		
	Mental and Written Calculations	
+ Addition	Children will engage in a wide variety of songs and rhymes, games and activities; They will begin to relate addition to combining two groups of objects, first by counting all and then by counting on from the largest number; They will find one more than a given number; In practical activities and through discussion they will begin to use the vocabulary involved in addition; e.g. 2+1=3 'What is one more than 2?'; e.g. 5+3=8 'You have five apples and I have three apples. How many apples altogether?'; Children are encouraged to develop a mental picture of the number system in their heads to use for calculation; They develop ways of recording calculations using pictures, symbols etc.; They use number lines and practical resources such as Multilink cubes, Dienes, Numicon etc. to support calculation and teachers *demonstrate* the use of the number line; Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones; Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3 etc.	
- Subtraction	Children will engage in a variety of counting songs, rhymes and practical activities; In practical activities and through discussion they will begin to use the vocabulary associated with subtraction; They will find one less than a given number; They will begin to relate subtraction to 'taking away' using objects to count 'how many are left' after some have been taken away? e.g. 6–2=4; 'Take two apples away. How many are left?'; 8-1=7 'What is one less than 8?'; Children will begin to count back from a given number; Children are encouraged to develop a mental picture of the number system in their heads to use for calculation; They develop ways of recording calculations using pictures, symbols etc.; They use number lines and practical resources such as Multilink cubes, Dienes, Numicon etc. to support calculation and teachers *demonstrate* the use of the number line; The number line should also be used to show that 6-3 means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart; Children then begin to use numbered lines to support their own calculations using a numbered line to count back in ones; Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2 etc.	
x Multiplication	Children will engage in a wide variety of songs and rhymes, games and activities; In practical activities and through discussion they will begin to use the vocabulary associated with multiplication and begin to solve problems involving doubling e.g. 3x2=6 'Three apples for you and three apples for me. How many apples altogether?'; 4x2=8 'What is double 4?'; Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s; They will work on practical problem solving activities involving equal sets or groups.	
÷ Division	Children will engage in a wide variety of songs and rhymes, games and activities; In practical activities and through discussion they will begin to use the vocabulary associated with division and begin to solve problems involving halving and sharing e.g. 6÷2=3 'Share the apples between two people. How many apples each?' e.g. 'Half of the apples are for you and half of the apples are for me.'; Children will understand equal groups and share items out in play and problem solving; They will count in 2s and 10s and later in 5s.	
YEAR 1		
	Mental Calculation	**Written Calculation**
+ Addition	Number bonds ('story' of 5, 6, 7, 8, 9 and 10); Count on in 1s from a given 2-digit number; Add two 1-digit numbers; Add three 1-digit numbers, spotting doubles or pairs to 10; Count on in 10s from any given 2-digit number; Add 10 to any given 2-digit number; Use number facts to add 1-digit numbers to 2-digit numbers e.g. *Use 4 + 3 to work out 24 + 3, 34 + 3 ;* Add by putting the larger number first;	
- Subtraction	Number bonds ('story' of 5, 6, 7, 8, 9 and 10); Count back in 1s from a given 2-digit number; Subtract one 1-digit number from another; Count back in 10s from any given 2-digit number; Subtract 10 from any given 2-digit number; Use number facts to subtract 1-digit numbers from 2-digit numbers e.g. *Use 7 – 2 to work out 27 – 2, 37 – 2 ;*	
x Multiplication	Begin to count in 2s, 5s and 10s; Begin to say what three 5s are by counting in 5s, or what four 2s are by counting in 2s, etc.; Double numbers to 10;	
÷ Division	Begin to count in 2s, 5s and 10s; Find half of even numbers to 12 and know it is hard to halve odd numbers; Find half of even numbers by sharing; Begin to use visual and concrete arrays or 'sets of' to find how many sets of a small number make a larger number;	

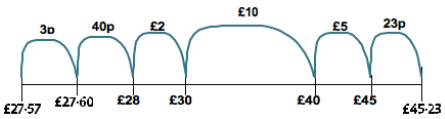
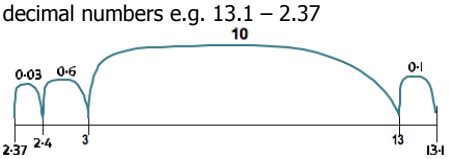
YEAR 2		
	Mental Calculation	**Written Calculation**
+ Addition	Number bonds – know all the pairs of numbers which make all the numbers to 12, and pairs with a total of 20; Count on in 1s and 10s from any given 2-digit number; Add two or three 1-digit numbers; Add a 1-digit number to any 2-digit number using number facts, including bridging multiples of 10 e.g. *45 + 4* e.g. *38 + 7* Add 10 and small multiples of 10 to any given 2-digit number; Add any pair of 2-digit numbers;	
- Subtraction	Number bonds – know all the pairs of numbers which make all the numbers to 12; Count back in 1s and 10s from any given 2-digit number; Subtract a 1-digit number from any 2-digit number using number facts, including bridging multiples of 10 e.g. *56 – 3* e.g. *53 – 5* Subtract 10 and small multiples of 10 from any given 2-digit number; Subtract any pair of 2-digit numbers by counting back in 10s and 1s or by counting up;	
x Multiplication	Count in 2s, 5s and 10s; Begin to count in 3s; Begin to understand that multiplication is repeated addition and to use arrays e.g. *3 × 4 is three rows of 4 dots;* Begin to learn the ×2, ×3, ×5 and ×10 tables, seeing these as 'lots of' e.g. *5 lots of 2, 6 lots of 2, 7 lots of 2;* Double numbers up to 20; Begin to double multiples of 5 to 100; Begin to double 2-digit numbers less than 50 with 1s digits of 1, 2, 3, 4 or 5;	
÷ Division	Count in 2s, 5s and 10s; Begin to count in 3s; Using fingers, say where a given number is in the 2s, 5s or 10s count e.g. *8 is the fourth number when I count in 2s;* Relate division to grouping e.g. *How many groups of 5 in 15?;* Halve numbers to 20; Begin to halve numbers to 40 and multiples of 10 to 100; Find $^1/_2$, $^1/_3$, $^1/_4$ and $^3/_4$ of a quantity of objects and of amounts (whole number answers);	
YEAR 3		
	Mental Calculation	**Written Calculation**
+ Addition	Know pairs with each total to 20 e.g. *2 + 6 = 8, 12 + 6 = 18, 7 + 8 = 15* ; Know pairs of multiples of 10 with a total of 100; Add any two 2-digit numbers by counting on in 10s and 1s or by using partitioning; Add multiples and near multiples of 10 and 100; Perform place-value additions without a struggle e.g. *300 + 8 + 50 = 358;* Use place value and number facts to add a 1-digit or 2-digit number to a 3-digit number e.g. *104 + 56 is 160 since 104 + 50 = 154 and 6 + 4 = 10* *676 + 8 is 684 since 8 = 4 + 4 and 76 + 4 + 4 = 84;* Add pairs of 'friendly' 3-digit numbers e.g. *320 + 450;* Begin to add amounts of money using partitioning;	Use expanded column addition to add two or three 3-digit numbers or three 2-digit numbers e.g. *466 + 358* 400 60 6 + 300 50 8 700 110 14 = 824 Use expanded column addition where digits in a column add to more than the column value e.g. *466 + 358* 400 60 6 300 50 8 + 100 10 800 20 4 Begin to use compact column addition to add numbers with 3 digits e.g. *347 + 286 + 495*

		347 286 + 495 21 1128 Begin to add like fractions e.g. $^3/_8 + {}^1/_8 + {}^1/_8$ Recognise fractions that add to 1 e.g. $^1/_4 + {}^3/_4$ e.g. $^3/_5 + {}^2/_5$
- Subtraction	Know pairs with each total to 20 e.g. *8 – 2 = 6* e.g. *18 – 6 = 12* e.g. *15 – 8 = 7* ; Subtract any two 2-digit numbers; Perform place-value subtractions without a struggle e.g. *536 – 30 = 506;* Subtract 2-digit numbers from numbers > 100 by counting up e.g. *143 – 76 is done by starting at 76. Then add 4 (80), then add 20 (100), then add 43, making the difference a total of 67;* Subtract multiples and near multiples of 10 and 100; Subtract, when appropriate, by counting back or taking away, using place value and number facts; Find change from £1, £5 and £10;	Use counting up as an informal written strategy for subtracting pairs of 3-digit numbers e.g. *423 – 357* e.g. *200 – 167*  Use counting up subtraction to find change from £1, £5 and £10 e.g. *£10.00 – £6.84*  Begin to subtract like fractions e.g. $^7/_8 - {}^3/_8$
x Multiplication	Know by heart all the multiplication facts in the ×2, ×3, ×4, ×5, ×8 and ×10 tables; Multiply whole numbers by 10 and 100; Recognise that multiplication is commutative; Use place value and number facts in mental multiplication e.g. *30 × 5 is 15 × 10;* Partition teen numbers to multiply by a 1-digit number e.g. *3 × 14 as 3 × 10 and 3 × 4;* Double numbers up to 50;	Use partitioning (grid multiplication) to multiply 2-digit and 3-digit numbers by 'friendly' 1-digit numbers e.g. *23 x 4* × | 20 | 3 4 | 80 | 12 = 92
÷ Division	Know by heart all the division facts derived from the ×2, ×3, ×4, ×5, ×8 and ×10 tables; Divide whole numbers by 10 or 100 to give whole number answers; Recognise that division is not commutative; Use place value and number facts in mental division e.g. *84 ÷ 4 is half of 42;* Divide larger numbers mentally by subtracting the 10th multiple as appropriate, including those with remainders e.g. *57 ÷ 3 is 10 + 9 as 10 × 3 = 30 and 9 × 3 = 27;* Halve even numbers to 100, halve odd numbers to 20;	Perform divisions just above the 10th multiple using horizontal or vertical jottings and understanding how to give a remainder as a whole number; Find unit fractions of quantities and begin to find non-unit fractions of quantities;
YEAR 4		
	Mental Calculation	**Written Calculation**
+ Addition	Add any two 2-digit numbers by partitioning or counting on; Know by heart/quickly derive number bonds to 100 and to £1; Add to the next 100, £1 and whole number e.g. *234 + 66 = 300* e.g. *3·4 + 0·6 = 4;* Perform place-value additions without a struggle e.g. *300 + 8 + 50 + 4000 = 4358;* Add multiples and near multiples of 10, 100 and 1000;	Build on expanded column addition to develop compact column addition with larger numbers e.g. *1466 + 4868* 1000 400 60 6 4000 800 60 8 + 1000 100 10 6000 300 30 4 Column addition for 3-digit and 4-digit numbers e.g. *5347 + 2286 + 1495*

	Add £1, 10p, 1p to amounts of money; Use place value and number facts to add 1-, 2-, 3- and 4-digit numbers where a mental calculation is appropriate e.g. *4004 + 156 by knowing that 6 + 4 = 10 and that 4004 + 150 = 4154 so the total is 4160;*	5347 2286 + 1495 121 9128 Add like fractions e.g. $^3/_5 + {}^4/_5 = {}^7/_5 = 1\,{}^2/_5$ Be confident with fractions that add to 1 and fraction complements to 1 e.g. $^2/_3 + \_ = 1$
- Subtraction	Subtract any two 2-digit numbers; Know by heart/quickly derive number bonds to 100; Perform place-value subtractions without a struggle e.g. *4736 – 706 = 4030;* Subtract multiples and near multiples of 10, 100, 1000, £1 and 10p; Subtract multiples of 0·1; Subtract by counting up e.g. *503 – 368 is done by adding 368 + 2 + 30 + 100 + 3 (so we added 135);* Subtract, when appropriate, by counting back or taking away, using place value and number facts; Subtract £1, 10p, 1p from amounts of money; Find change from £10, £20 and £50;	Use expanded column subtraction for 3- and 4-digit numbers e.g. *726 – 358* 600 110 16 ~~700~~ ~~20~~ ~~6~~ – 300 50 8 300 60 8 Begin to develop compact column subtraction e.g. *726 – 358* 6 11 16 ~~7~~ ~~2~~ ~~6~~ – 3 5 8 3 6 8 Use complementary addition to subtract amounts of money, and for subtractions where the larger number is a near multiple of 1000 or 100 e.g. *2002 – 1865;* Use counting up subtraction to find change from £10, £20, £50 and £100 e.g. *£50 – £34.75*  *(Answer found as £10 + £5 + 20p + 5p)*; Subtract like fractions e.g. $^4/_5 - {}^3/_5 = {}^1/_5$ Use fractions that add to 1 to find fraction complements to 1 e.g. $1 - {}^2/_3 = {}^1/_3$
x Multiplication	Know by heart all the multiplication facts up to 12 × 12; Recognise factors up to 12 of 2-digit numbers; Multiply whole numbers and 1-place decimals by 10, 100, 1000; Multiply multiples of 10, 100 and 1000 by 1-digit numbers e.g. *300 × 6* e.g. *4000 × 8;* Use understanding of place value and number facts in mental multiplication e.g. *36 × 5 is half of 36 × 10* e.g. *50 × 60 = 3000;* Partition 2-digit numbers to multiply by a 1-digit number mentally e.g. *4 × 24 as 4 × 20 and 4 × 4;* Multiply near multiples by rounding e.g. *33 × 19 as (33 × 20) – 33;* Find doubles to double 100 and beyond using partitioning; Begin to double amounts of money e.g. *£35·60 doubled is £71·20;*	Use grid multiplication to multiply 3-digit numbers by 1-digit numbers e.g. *253 x 6* × 200 50 3 6 1200 300 18 = 1518 Use a vertical written method to multiply a 3-digit number by a 1-digit number (ladder method) e.g. *253 x 6* 2 5 3 × 6 1 2 0 0 ← 6 × 200 3 0 0 ← 6 × 50 + 1 8 ← 6 × 3 1 5 1 8 Use an efficient written method to multiply a 2-digit number by a number between 10 and 20 by partitioning (grid method) e.g. *48 x 16* × 10 6 40 400 240 = 640 8 80 48 = 128 768
÷ Division	Know by heart all the division facts up to 144 ÷ 12; Divide whole numbers by 10, 100, to give whole number answers or answers with 1 decimal place;	Use a written method to divide a 2-digit or a 3-digit number by a 1-digit number e.g. *86 ÷ 3 as 20 x 3 (60) and 8 x 3 (24), remainder 2*

	Divide multiples of 100 by 1-digit numbers using division facts e.g. *3200 ÷ 8 = 400;* Use place value and number facts in mental division e.g. *245 ÷ 20 is half of 245 ÷ 10;* Divide larger numbers mentally by subtracting the 10th or 20th multiple as appropriate e.g. *156 ÷ 6 is 20 + 6 as 20 × 6 = 120 and 6 × 6 = 36;* Find halves of even numbers to 200 and beyond using partitioning; Begin to halve amounts of money e.g. *half of £52·40 is £26·20;*	8 6 ÷ 3 = ☐ ☐ × 3 = 8 6 2 0 × 3 = 6 0 2 6 8 × 3 = 2 4 2 2 8 8 6 ÷ 3 = 2 8 r2 Give remainders as whole numbers; Begin to reduce fractions to their simplest forms; Find unit and non-unit fractions of larger amounts;
YEAR 5		
	Mental Calculation	**Written Calculation**
+ Addition	Know number bonds to 1 and to the next whole number; Add to the next 10 from a decimal number e.g. *13·6 + 6·4 = 20;* Add numbers with 2 significant digits only, using mental strategies e.g. *3·4 + 4·8* e.g. *23 000 + 47 000;* Add 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000 e.g. *8000 + 7000* e.g. *600 000 + 700 000;* Add near multiples of 10, 100, 1000, 10 000 and 100 000 to other numbers e.g. *82 472 + 30 004;* Add decimal numbers which are near multiples of 1 or 10, including money e.g. *6·34 + 1·99* e.g. *£34·59 + £19·95;* Use place value and number facts to add two or more 'friendly' numbers, including money and decimals e.g. *3 + 8 + 6 + 4 + 7* e.g. *0·6 + 0·7 + 0·4* e.g. *2056 + 44;*	Use column addition to add two or three whole numbers with up to 5 digits; Use expanded column addition to add several amounts of money (2 decimal places) e.g. *£14.64 + £28.78 + £12.26* £14 60p 4p £28 70p 8p + £12 20p 6p £1 10p £55 60p 8p Leading to a compact column addition to add any pair of 2-place decimal numbers, including amounts of money e.g. *15.68 + 27.86* 15·68 + 27·86 11·1 43·54 Begin to add related fractions using equivalences e.g. $^1/_2 + ^1/_6 = ^3/_6 + ^1/_6$ Choose the most efficient method in any given situation;
- Subtraction	Subtract numbers with 2 significant digits only, using mental strategies e.g. *6·2 – 4·5* e.g. *72 000 – 47 000;* Subtract 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000 e.g. *8000 – 3000* e.g. *60 000 – 200 000;* Subtract 1- or 2-digit near multiples of 10, 100, 1000, 10 000 and 100 000 from other numbers e.g. *82 472 – 30 004;* Subtract decimal numbers which are near multiples of 1 or 10, including money e.g. *6·34 – 1·99* e.g. *£34·59 – £19·95;* Use counting up subtraction, with knowledge of number bonds to 10, 100 or £1, as a strategy to perform mental subtraction e.g. *£10 – £3·45* e.g. *1000 – 782;* Recognise fraction complements to 1 and to the next whole number e.g. *1 $^2/_5$ + $^3/_5$ = 2;*	Use compact or expanded column subtraction to subtract numbers with up to 5 digits e.g. *16324 – 8516* 0 15 13 1 14 ~~1~~ ~~6~~ ~~3~~ ~~2~~ ~~4~~ – 8 5 1 6 7 8 0 8 Continue to use counting up subtraction for subtractions involving money, including finding change e.g. *£50 – £28.76*  *(Answer found as £20 + £1 + 20p + 4p)*; Use counting up subtraction to subtract decimal numbers e.g. *4.2 – 1.74*  Use complementary addition for subtractions where the larger number is a multiple or near

		multiple of 1000; Use complementary addition for subtractions of decimal numbers with up to 2 places, including amounts of money; Begin to subtract related fractions using equivalences e.g. $^1/_2 - {}^1/_6 = {}^2/_6$ Choose the most efficient method in any given situation;
x Multiplication	Know by heart all the multiplication facts up to 12 × 12; Multiply whole numbers and 1- and 2-place decimals by 10, 100, 1000, 10 000; Use knowledge of factors and multiples in multiplication e.g. *43 × 6 is double 43 × 3* e.g. *28 × 50 is $^1/_2$ of 28 × 100 = 1400;* Use knowledge of place value and rounding in mental multiplication e.g. *67 × 199 as 67 × 200 – 67;* Use doubling and halving as a strategy in mental multiplication e.g. *58 × 5 is half of 58 × 10* e.g. *34 × 4 is 34 doubled twice;* Partition 2-digit numbers, including decimals, to multiply by a 1-digit number mentally e.g. *6 × 27 as 6 × 20 (120) plus 6 × 7 (42)* e.g. *6·3 × 7 as 6 × 7 (42) plus 0·3 × 7 (2·1);* Double amounts of money by partitioning e.g. *£37·45 doubled is £37 doubled (£74) plus 45p doubled (90p) giving a total of £74·90;*	Use short multiplication to multiply a 1-digit number by a number with up to 4 digits e.g. *435 x 8* 435 × 8 = 3480 Use long multiplication to multiply 3-digit and 4-digit numbers by a number between 11 and 20 e.g. *48 x 16* 48 × 16 = 768 Grid multiplication of numbers with up to 2 decimal places by 1-digit numbers e.g. *1.34 x 6* × | 1 | 0·3 | 0·04 | = 8·04 6 | 6 | 1·8 | 0·24 Choose the most efficient method in any given situation; Find simple percentages of amounts e.g. *10%, 5%, 20%, 15% and 50%;* Begin to multiply fractions and mixed numbers by whole numbers ≤ 10 e.g. *4 × $^2/_3 = {}^8/_3 = 2\,{}^2/_3$*
÷ Division	Know by heart all the division facts up to 144 ÷ 12; Divide whole numbers by 10, 100, 1000, 10 000 to give whole number answers or answers with 1, 2 or 3 decimal places; Use doubling and halving as mental division strategies e.g. *34 ÷ 5 is (34 ÷ 10) × 2;* Use knowledge of multiples and factors, as well as tests for divisibility, in mental division e.g. *246 ÷ 6 is 123 ÷ 3* e.g. *We know that 525 divides by 25 and by 3;* Halve amounts of money by partitioning e.g. *$^1/_2$ of £75·40 = $^1/_2$ of £75 (£37·50) plus half of 40p (20p) which is £37·70;* Divide larger numbers mentally by subtracting the 10th or 100th multiple as appropriate e.g. *96 ÷ 6 is 10 + 6, as 10 × 6 = 60 and 6 × 6 = 36* e.g. *312 ÷ 3 is 100 + 4 as 100 × 3 = 300 and 4 × 3 = 12;* Know tests for divisibility by 2, 3, 4, 5, 6, 9 and 25; Know square numbers and cube numbers; Reduce fractions to their simplest form;	Use a written version of a mental strategy to divide 3-digit numbers by 1-digit numbers e.g. *326 ÷ 6 as 50 x 6 (300) and 4 x 6 (24), remainder 2* 326 ÷ 6 = □ □ × 6 = 326 50 × 6 = 300 26 4 × 6 = 24 2 54 326 ÷ 6 = 54 r2 Use short division to divide a number with up to 4 digits by a 1-digit number e.g. *139 ÷ 3* 3 | 1 3 19 = 46 r1 Give remainders as whole numbers or as fractions; Find non-unit fractions of large amounts; Turn improper fractions into mixed numbers and vice versa; Choose the most efficient method in any given situation;
YEAR 6		
	Mental Calculation	**Written Calculation**
+ Addition	Know by heart number bonds to 100 and use these to derive related facts e.g. *3·46 + 0·54;* Derive, quickly and without difficulty, number bonds to 1000; Add small and large whole numbers where the use of place value or number facts makes the	Use compact column addition to add numbers with up to 5 digits and decimal numbers up to 2 decimal places, including money e.g. *£14.64 + £28.78 + £12.26*

	calculation do-able mentally e.g. *34 000 + 8000;* Add multiples of powers of 10 and near multiples of the same e.g. *6345 + 199;* Add negative numbers in a context such as temperature where the numbers make sense; Add two 1-place decimal numbers or two 2-place decimal numbers less than 1 e.g. *4·5 + 6·3* e.g. *0·74 + 0·33;* Add positive numbers to negative numbers; e.g. *Calculate a rise in temperature or continue a sequence beginning with a negative number*	£14·64 + £28·78 £12·26 11·1 £55·68 Use column addition to add decimal numbers with up to 3 decimal places; Add mixed numbers and fractions with different denominators;
- Subtraction	Use number bonds to 100 to perform mental subtraction of any pair of integers by complementary addition e.g. *1000 – 654 as 46 + 300 in our heads;* Use number bonds to 1 and 10 to perform mental subtraction of any pair of 1-place or 2-place decimal numbers using complementary addition and including money e.g. *10 – 3·65 as 0·35 + 6* e.g. *£50 – £34·29 as 71p + £15;* Use number facts and place value to perform mental subtraction of large numbers or decimal numbers with up to 2 places e.g. *467 900 – 3005* e.g. *4·63 – 1·02;* Subtract multiples of powers of 10 and near multiples of the same; Subtract negative numbers in a context such as temperature where the numbers make sense;	Use compact column subtraction to subtract numbers with up to 6 digits e.g. *34685 – 16458* 2 14 7 15 ~~3~~ ~~4~~ 6 ~~8~~ ~~5~~ – 1 6 4 5 8 1 8 2 2 7 Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000 or 10 000; Use counting up subtraction when dealing with money e.g. *£45.23 – £27.57*  *(Answer found as £10 + £5 + £2 + 40p + 23p + 3p)*; Use counting up subtraction to subtract decimal numbers e.g. 13.1 – 2.37  *(Answer found as 10 + 0.6 + 0.1 + 0.03)*; Use complementary addition for subtractions of decimal numbers with up to 3 places, including money; Subtract mixed numbers and fractions with different denominators;
x Multiplication	Know by heart all the multiplication facts up to 12 × 12; Multiply whole numbers and decimals with up to 3 places by 10, 100 or 1000 e.g. *234 × 1000 = 234 000* e.g. *0·23 × 1000 = 230;* Identify common factors, common multiples and prime numbers and use factors in mental multiplication e.g. *326 × 6 is 652 × 3 which is 1956;* Use place value and number facts in mental multiplication e.g. *4000 × 6 = 24 000* e.g. *0·03 × 6 = 0·18;* Use doubling and halving as mental multiplication strategies, including to multiply by 2, 4, 8, 5, 20, 50 and 25 e.g. *28 × 25 is a quarter of 28 × 100 = 700;* Use rounding in mental multiplication e.g. *34 × 19 as (34 × 20) – 34;* Multiply 1- and 2-place decimals by numbers up to and including 10 using place value and partitioning e.g. *3·6 × 4 is 12 + 2·4* e.g. *2·53 × 3 is 6 + 1·5 + 0·09;* Double decimal numbers with up to 2 places using partitioning e.g. *36·73 doubled is double 36 (72) plus double 0·73 (1·46);*	Use short multiplication to multiply numbers with up to 4 digits by 1-digit numbers e.g. *3743 x 6* 3 7 4 3 × 6 4 2 1 2 2 4 5 8 Use long multiplication to multiply numbers with up to 4 digits by a 2-digit number e.g. *456 x 38* 4 5 6 × 3 8 1 3 6 8 0 3 6 4 4 8 1 1 1 7 3 2 8 Use short multiplication to multiply a 1-digit number by a number with 1 or 2 decimal places, including amounts of money e.g. *£13.72 x 6*

		£ 1 3.7 2 × 6 2 4 1 £ 8 2.3 2 Multiply fractions and mixed numbers by whole numbers; Multiply fractions by proper fractions; Use percentages for comparison and calculate simple percentages;
÷ Division	Know by heart all the division facts up to 144 ÷ 12; Divide whole numbers by powers of 10 to give whole number answers or answers with up to 3 decimal places; Identify common factors, common multiples and primes numbers and use factors in mental division e.g. *438 ÷ 6 is 219 ÷ 3 which is 73;* Use tests for divisibility to aid mental calculation; Use doubling and halving as mental division strategies, for example to divide by 2, 4, 8, 5, 20 and 25 e.g. *628 ÷ 8 is halved three times: 314, 157, 78·5;* Divide 1- and 2-place decimals by numbers up to and including 10 using place value e.g. *2·4 ÷ 6 = 0·4* e.g. *0·65 ÷ 5 = 0·13* e.g. *£6·33 ÷ 3 = £2·11;* Halve decimal numbers with up to 2 places using partitioning e.g. *Half of 36·86 is half of 36 (18) plus half of 0·86 (0·43);* Know and use equivalence between simple fractions, decimals and percentages, including in different contexts; Recognise a given ratio and reduce a given ratio to its lowest terms;	Use short division to divide a number with up to 4 digits by a 1-digit or a 2-digit number e.g. *139 ÷ 3* 4 6 r 1 3 | 1 3 ¹9 Use long division to divide 3-digit and 4-digit numbers by 2-digit numbers e.g. *4176 ÷ 13* 300 + 20 + 1, r 3 — 4176 ÷ 13 = 321 r 3 13 | 4176 −3900 276 −260 16 −13 3 Give remainders as whole numbers or as fractions or as decimals; Divide a 1-place or a 2-place decimal number by a number ≤ 12 using multiples of the divisors; Divide proper fractions by whole numbers;

Links with other School Policies and Practices

St. Mary's Calculation Policy for Mathematics will operate in conjunction with a number of other school policies, practices and action plans including:

- Mathematics Policy
- Teaching and Learning Policy
- Health and Safety Policy

It would be good practice for all staff to familiarise themselves with both this document and the suggested linked documents.

Writing and reviewing the Calculation Policy 2014-15 arrangements

Mathematics Subject Leader
Mark Lett

Our Calculation Policy for Mathematics has been written by Mr Mark Lett on behalf of the school, building on guidance. It has been agreed by all staff and approved by governors.

The Calculation Policy for Mathematics and its implementation will be reviewed annually. Following this review the policy will be made available to all stakeholders via the school website.

Policy Reviewed by the Mathematics Subject Leader:
Name: **Mr Mark Lett**
Date: **March 2015**

Reviewed in: **January-February 2015**
Formally adopted by Governors: **March 2015**
Suggested Date of Next review: **March 2016**

Appendix A

Glossary

2-digit – a number with 2 digits like 23, 45, 12 or 60
3-digit – a number with 3 digits like 123, 542, 903 or 561
Addend – a number to be added to another.
Addition facts – knowing that 1+1 = 2 and 1+3 = 4 and 2+5 = 7. Normally we only talk about number facts with totals of 20 and under.
Approximation – a number or result that is not exact. In a practical situation an approximation is sufficiently close to the actual number for it to be useful.
Array – An array is an arrangement of a set of numbers or objects in rows and columns – it is mostly used to show how you can group objects for repeated addition or subtraction.
Binary operation – a rule for combining two numbers in the set to produce a third also in the set. Addition, subtraction, multiplication and division of real numbers are all binary operations.
Bridge to ten – a strategy when using number lines. Adding a number that takes you to the next 'tens' number.
Bus Stop method – traditional method for division with a single digit divisor.
Cardinal numbers – a cardinal number denotes quantity, as opposed to an ordinal number which denotes position within a series. 1, 2, 5, 23 are examples of cardinal numbers.
Chunking – method of division involving taking chunks or groups or the divisor away from the larger number.
Columnar addition or subtraction – a formal method of setting out an addition or a subtraction in ordered columns with each column representing a decimal place value and ordered from right to left in increasing powers of 10.
Common factor – a number which is a factor of two or more other numbers. E.g. 3 is a common factor of the numbers 9 and 30
Common multiple – an integer which is a multiple of a given set of integers. E.g. 24 is a common multiple of 2, 3, 4, 6, 8 and 12
Compensation – a mental or written calculation strategy where one number is rounded to make the calculation easier. The calculation is then adjusted by an appropriate compensatory addition or subtraction. E.g. 56+38 is treated as 56+40 and then 2 is subtracted to compensate; 27×19 is treated as 27×20 and then 27 (i.e. 27×1) is subtracted to compensate; 67−39 is treated as 67−40 and then 1 is added to compensate.
Complement – in addition, a number and its complement have a given total. Example: When considering complements in 100, 67 has the complement 33, since 67+33=100
Concrete apparatus – objects to help children count: these are most often cubes (e.g. Multilink) but can be anything they can hold and move. Dienes (purple hundreds, tens and ones blocks), Base-10, Numicon, Cuisenaire rods are also referred to as concrete apparatus.
Consecutive – following in order. Consecutive numbers are adjacent in a count. Examples: 5, 6, 7 are consecutive numbers. 25, 30, 35 are consecutive multiples of 5
Cube number – a number that can be expressed as the product of three equal integers. Example: 27=3×3×3. Consequently, 27 is a cube number; 27 is the cube of 3 or 3 cubed.
Decimal number – most commonly used synonymously with decimal fractions where the number of tenths, hundredths, thousandths, etc. are represented as digits following a decimal point (e.g. 21.349). The decimal point is placed at the right of the ones column. Each column after the decimal point is a decimal place.
Decimal fraction – tenths, hundredths, thousandths etc. represented by digits following a decimal point. E.g. 0.125 is equivalent to 1/10+2/100+5/1000 or 1/8
Digit – one of the symbols of a number system; most commonly the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. E.g. the number 29 is a 2-digit number; there are three digits in 2.95. The position or place of a digit in a number conveys its value.
Dividend – in division, the number that is divided. E.g. in 15÷3, 15 is the dividend.
Divisor – the smaller number in a division calculation. E.g. 15÷3, 3 is the divisor. The number in each group for chunking.
Double – multiply a number by 2. E.g. Double 13 is 26 (13x2=26).
Efficient methods – a means of calculation (which can be mental or written) that achieves a correct answer with as few steps as possible. In written calculations this often involves setting out calculations in a columnar layout. If a calculator is used the most efficient method uses as few key entries as possible.

Estimate – to arrive at a rough or approximate answer by calculating with suitable approximations for terms or, in measurement, by using previous experience.
Even number – an integer that is divisible by 2.
Exchanging – Moving a 'ten' or a 'hundred' from its column into the next column and splitting it up into ten 'ones' or ten 'tens' and putting it into a different column.
Expanded Multiplication – a method for multiplication where each stage is written down and then added up at the end in a column.
Facts – the word 'fact' is related to the four operations and the instant recall of knowledge about the composition of a number. E.g. an addition fact for 20 could be 10+10; a subtraction fact for 20 could be 20-9=11. A multiplication fact for 20 could be 4x5 and a division fact for 20 could be 20÷5=4.
Find the difference – A method for subtraction involving counting up from the smaller to the larger number.
Four operations – common shorthand for the four arithmetic operations of addition, subtraction, multiplication and division.
Grid method – a method for multiplying two numbers together involving partitioning.
Half – a number, shape or quantity divided into 2 equal parts.
Halve – divide a number by 2. E.g. Halve 24 (24÷2=12).
Hundred square – a 10 by 10 square grid numbered 1 to 100. A similar grid could be numbered as a 0 – 99 grid.
Integer – a number with no decimal point. Any of the positive or negative whole numbers and zero. E.g. -2, -1, 0, +1, +2…
Inverse – the opposite operation. Addition is the inverse of subtraction; multiplication is the inverse of division.
Long Multiplication – column multiplication where only the significant figures are noted.
Number bonds to ten – 2 numbers that add together to make ten, like 2 and 8, or 6 and 4.
Number bonds to 100 – 2 numbers that add together to make 100 like 20 and 80, or 45 and 65 or 12 and 88.
Number line – a line either with numbers or without (a blank number line). Children use this tool to help them count on for addition or subtraction and also in multiplication and division.
Number line Chunking – method of division involving taking chunks or groups of the divisor away from the larger number.
Number sentence – writing out a calculation with just the numbers in a line e.g. 2+4=6 or 35÷7=5 or 12x3=36 or 32–5=27
Number square – a square grid in which cells are numbered in order.
Numeral – a symbol used to denote a number. The Roman numerals I, V, X, L, C, D and M represent the numbers one, five, ten, fifty, one hundred, five hundred and one thousand. The Arabic numerals 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are used in the Hindu-Arabic system giving numbers in the form that is widely used today.
Odd number – an integer that has a remainder of 1 when divided by 2.
Ordinal number – a term that describes a position within an ordered set. E.g. first, second, third, fourth... twentieth etc.
Partition – split up a larger number into the hundreds, tens and ones. E.g. 342 is partitioned into 300 and 40 and 2
Pictorial – pictorial representations enable learners to use pictures and images to represent the structure of a mathematical concept. The pictorial representation may build on the familiarity with concrete objects.
Place holder – the zero numeral is used as a place holder to denote the absence of a particular power of 10.
Place Value – knowing that in the number 342 the '3' means '3 hundreds', the '4' means '4 tens' and the '2' means '2'.
Prime number – a whole number greater than 1 that has exactly two factors, itself and 1. Examples: 2 (factors 2, 1), 3 (factors 3, 1). 51 is not prime (factors 51, 17, 3, 1).
Product – the result of multiplying one number by another. Example: The product of 2 and 3 is 6 since 2×3=6.
Quarter – a number, shape or quantity divided into 4 equal parts.
Quotient – the result of a division. Example: 45÷3=15, 15 is the quotient.
Recombine – for addition, once you have partitioned numbers into hundreds, tens and ones then you have to add the hundreds together, then add the tens to that total, then add the ones to that total.
Remainder – a whole number left over after a division calculation. E.g. 29 divided by 7 = 4 remainder 1.
Repeated addition – repeatedly adding groups of the same size for multiplication.

Repeated subtraction – repeatedly subtracting groups of the same size for division.
Significant digit – the digit in a number with the largest value. E.g. in 34 the most significant digit is the 3, as it has a value of '30' and the '4' only has a value of '4'.
Single digit – a number with only one digit. These are always less than 10.
Square number – a number that can be expressed as the product of two equal numbers. Example 36=6x6 and so 36 is a square number or "6 squared". A square number can be represented by dots in a square array.
Subtrahend – a number to be subtracted from another.
Sum – the result of one or more additions.
Symbol – a letter, numeral or other mark that represents a number, an operation or another mathematical idea. Example: L (Roman symbol for fifty), > (is greater than).
Taking away – a method for subtraction involving counting backwards from the larger to the smaller number.
Tens number – a number in the ten times tables: 10,20,30,40,50, etc.
Triangular number – a number that can be represented by a triangular array of dots with the number of dots in each row from the base decreasing by one.
Zero – nought or nothing; zero is the only number that is neither positive nor negative.