

## **CALCULATION POLICY**

May 2015

Glossary

Array: a regular arrangement of objects

4 x 3 or 3 x 4



Base 10:- cubes used to give a visual representation of 1, 10, 100 and 1000



**Bridging:** (through 10 or 100)-to use knowledge of number bonds to count on or back to the nearest/best 10 as an efficient strategy to get to the final number eg. 13 + 8 as 13 + 7 = 20 + 1 = 21

**Commutativity:** that addition or multiplication can be done in any order eg.. 2x3 is the same as 3x2

**Compensation:** to use known number facts to calculate a number that is near to the one known eg.. 27 + 9 as 27 + 10 then adjust (compensate) by subtracting 1

Formal written method: a method of calculation with a proven algorithm

Integers: a complete number either positive or negative, not a fraction or decimal eg.. 3, -3, 103

**Inverse:** opposite/reverse operations eg..  $4 + 6 = 10 \ 10 - 4 = 6$ 

Numicon: shapes that give a visual representation of numbers from 1-10 and can be combined to make larger numbers



Place value counters: counters that have a numerical value (0.001, 0.01, 0.1, 1, 10, 100 or 1000) marked on them



Whole number: a complete positive number e.g. 3, 41, 1007; not negative, fraction or decimal

For more definitions visit: http://www.amathsdictionaryforkids.com/dictionary.html This policy has calculation methods for all 4 operations and is designed to be used in a linear progression. The year groups attached *are guidelines* in line with the National Curriculum however children should use the strategy appropriate to their development as assessed by their class teacher. The children will be encouraged to draw upon strategies they have learned in previous years as this helps to consolidate their use and understanding of the methods.

Throughout their lessons, children will be given opportunities to apply these calculation methods in a range of problem solving contexts. This is paramount in helping the children become secure with each method. By secure, we mean they can understand and explain each method clearly and in particular have confident understanding of the place value involved with the methods.

Secure knowledge of number facts and in particular place value are *key* to children's success in mastering written methods and therefore is a **key priority**.

Moving on to the next calculation method (particularly from another year group) will be at the discretion of the class teacher as they have the greatest knowledge of the children's understanding. Despite formal written methods being seemingly easy to learn, they are challenging to understand and apply if a secure knowledge and understanding of place value is not in place. Children should not move onto the next stage if they are not ready, not confident and/or show a lack of understanding of the method.

Children should be encouraged to approximate their answers before calculating and use their understanding of number and place value to check their answers.

By the end of year 6, children should feel secure range of mental and written calculation methods. Selection of method will depend upon the numbers involved. Children will be taught how and encouraged to select the most appropriate method throughout each year group as they learn new methods.

1				
	Addition	Subtraction	Multiplication	Division
Reception	Addition Counting altogether from 0 (combining) and then counting on <i>initially verbally and with concrete resources and progressing to writing numerals:</i> Using objects: 4+3=7 $7+3=10Using fingers:4+3=7$ $7+3=10Using fingers:4+3=8Using Numicon:3+3=6Drawing pictures:3+3=6Drawing pictures:3+2=5Counting on a number line in 1s with fingers:4+3=7$ $3+2=5$	Subtraction Removing, covering, crossing off and counting back initially verbally and with concrete resources and progressing to writing numerals: Using objects (taking them away): 7 - 2 = 5 Using fingers (counting back, folding fingers down): 7 - 2 = 5 Using Numicon (overlaying or covering up): 6 - 2 = 4 Drawing pictures (crossing off): 7 - 2 Counting on a bead bar/string: 7 - 2 Counting back on a number line in 1s with fingers: 1 - 2 = 5	Counting in groups of 2, 5 and 10 using concrete objects, singing songs using concrete objects:   Using objects:   Using objects:     2     2     4   6   8   10   12   14   16     10   20   30        Doubling (overlaying Numicon):	Division Halving using vocabulary of sharing: Using objects (sorting into 2 groups): Half of 8 cubes is 4 cubes Using Numicon: Using real life examples e.g. pizza:







	Addition	Subtraction	Multiplication		Division		
Year 4	AdditionContinuing to select the number line for appropriate calculations and progressing to:Using formal column addition with exchanging 'carrying':48 $+ .36$ $\frac{84}{-1}$ $\frac{1}{-1}$ Becoming secure in this method to add three or more numbers:37 $+ 28$ $\frac{19}{84}$ $\frac{2}{2}$ Becoming secure in using this method with three and four digit whole numbers: $2 4 3$ $35 2 6$ $+ 59 7$ $+ 159 7$ $\frac{3}{840}$ $5123$ Using expanded column addition to add numbers with up to two decimal places with place value counters to support understanding of exchanging 'carrying' initially:UThisUThisUThisUThisHths $2 + 0.2 + 0.08$ $+ 1 + 0.1 + 0.03$ $3 + 0.3 + 0.11$ UThisHths $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ $0 + 0.1 + 0.03$ <	SubtractionContinuing to select the number line for appropriate calculations and progressing to:Using formal column subtraction (decomposition) with exchanging: ${}^3 \times {}^1 3$ $- 2.7$ $1.6$ Becoming secure in using this method with three and four digit whole numbers including those involving a digit value of 0: ${}^8 9' 48$ $- 2.3 \times 5.6$ $-263$ $- 2.3 \times 5.6$ $-263$ $- 1.3.8.5$ $-263$ $- 2.3 \times 5.6$ $-10.7 1$ $- 4.7.8.9.9$ Using expanded column subtraction to subtract numbers with up to two decimal places with place value counters to support understanding of exchanging initially:U Tths HthsExchange 0.1 for ten hundredths $0.1 0.7$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $1 + 0.0 + 0.07$ $0.1 0.0 0.00$ $0.0 0.0 0.00$ $0.0 0.0 0.00$	Continui multiplic to: Using pla understa 16 x 3 x 3 Using th and three 7 x 28 x 7 Using th multiply a single of 38 x 7 = 30 + 8 x 7 56 210 266 Using th two-digi digit:	Multipli ing to use the gr cation facts they ace value counter anding: 10 10 10 10 10 10 10 10 10 10	ication   id method and   know and progressing   ers to support   6     6     18   18   18   18   248   omultiply two-digit   by a single digit:     8   56   56   56   56   56   56   196   nal column method to orree-digit numbers by   on method to multiply: numbers by a single	Divi Continuing to use the c progressing to: Using cups to group in I (using place value count Using cups to group in I (using multiplication factors) Using a number line to 'chunks' (using multiplication factors) Using a vertical 'chunki two and three digit nur (using multiplication factors) Using a vertical 'chunki two and three digit nur (using multiplication factors)	sion up method and arger amounts 'chunks' ters): $65 \div 5 =$ $65 \div 5 =$ 5 groups of 10 = 50 55 - 50 = 15 5 groups of 3 = 15 15 - 15 = 0 There is 13 in each cup so $65 \div 5 = 13$ arger amounts 'chunks' cts): $65 \div 5 =$ 50 $55$ groups of 10 = 50 55 - 50 = 15 15 - 15 = 0 There is 13 in each cup so $65 \div 5 = 13$ jump in larger groups cation facts): tracted -10 groups of 5 -50 65 -50
	$\begin{array}{c} +1+0.1+0.03\\ \hline 3+0.3+0.11\\ \hline \\ \end{array}$	Using formal column subtraction to subtract numbers with up to three decimal places: 0 1 7 1 - 7.49 5.38	<ul> <li><u>2bb</u></li> <li>Using the formal column method to multiply two-digit and three-digit numbers by a single digit:</li> <li>39</li> <li>x 8</li> <li><u>312</u>/<sub>7</sub></li> </ul>			91 ÷ 7 = 13 7 91 - $\frac{70}{21}$ (10 × 7) - $\frac{21}{21}$ (3 × 7) 0	$\frac{Fact box:}{1 \times 7 = 7}$ $2 \times 7 = 14$ $10 \times 7 = 70$ $5 \times 7 = 35$ $10 + 3 = 13$

	Addition	Subtraction	Multiplication			Division			
	Continuing to use the formal column addition method for calculations involving whole numbers greater than 4 digits and for numbers with up to 3 decimal places:	Continuing to use the formal column subtraction method for calculations involving whole numbers greater than 4 digits and for numbers with up to 3 decimal places:	Continuing to use the grid method and form written method as well as the multiplication facts up to 12 x 12 and <i>progressing to</i> :				mal n	Continuing to use a vertical 'chunking' method to divide a two and three digit number by a single digit and <i>progressing to</i> :	
	Using Base 10 to support understanding:	Using Base 10 to support understanding:	Using the grid method to multiply two-digit and three-digit numbers by a two-digit number (using place value counters if necessary):					dividing a two, three and four digit number by a single digit:	
Year 5	<image/>		x 10 6 Using an multiply a two-di 56 <u>x 14</u> 24 200 60 <u>500</u> <u>784</u> Using th multiplic digit num TU 56 <u>x 14</u> 24 200 60 <u>500</u> <u>784</u> Using th multiplic digit num TU 56 <u>x 14</u> 224 <u>200</u> 60 <u>500</u> <u>784</u> Using th multiplic <u>56</u> <u>56</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>784</u> <u>785</u> <u>785</u> <u>785</u> <u>785</u> <u>785</u> <u>785</u> <u>785</u> <u>785</u> <u>785</u> <u>78</u>	30 300 180 34( expanded two-digit git number formal c ation) to r nbers by a Multi (ones Place show tensor TIP: Sc record colour Multi Add u record	4 40 24 0 + 204 = d formal co and three- er: $4 \times 6 = 24$ $4 \times 50 = 2$ $10 \times 50 = 2$ $10 \times 6 = 6$ $10 \times 50 =$ column me multiply two a two-digit ply each digit ply each digits ply each digits	340 204 544 blumn method digit numbers thod (long vo-digit and the number: it in 56 by 4 uni nits column to w multiplying by find it helpful to units in differing it in 56 by 1 ten n addition and	to by ree-	81 ÷ 3 = 27 Using a vertical 'chunkin two and three digit num (using multiplication fact 406÷ 29 = 14 29 <sup>3</sup> <sup>4</sup> 06 - 290 (10 × 29) <u>116</u> <u>116</u> (4 × 29) 0	$\frac{2}{8} \frac{7}{1}$ g' method to divide bers by a single digit is): $\frac{Fact box:}{1 \times 29 = 29}$ $2 \times 29 = 58$ $10 \times 29 = 290$ $5 \times 29 = 145$

	Addition	Subtraction	Multiplication	Division		
C n (1	hildren should be confident in selecting the nost appropriate method of calculation mental or written) from those included in this olicy and particularly including:	Children should be confident in selecting the most appropriate method of calculation (mental or written) from those included in this policy and particularly including:	Continuing to use the grid method and formal method to multiply up to 4-digit whole numbers by 2-digit numbers and <i>progressing</i> <i>to</i> :	Continuing to use the short division method for dividing by single digits and <i>progressing to</i> : Finding a decimal remainder using the formal short division method (dividing by both a single and two digit number):		
	and 100	Using number bonds to 1, 10, 20, 100 and 100	counters initially to multiply numbers with up to two decimal places by a single digit:	$116 \div 8 = 14.5$		
	Using partitioning	<ul> <li>Using partitioning</li> </ul>	Units/Ones Tenths Hundredths			
	Using a number line both mentally and in written form	<ul> <li>Using a number line both mentally and in written form</li> </ul>		014.5 8 116 0		
	Using bridging through a number	<ul> <li>Using bridging through a number</li> </ul>	4 Units/Ones 12 Tenths 8 Hundredths	0.110.0		
	Using compensating	<ul> <li>Using compensating</li> </ul>	4 Units + 12 Tenths + 8 Hundredths = 5.28	Using the formal long division method:		
Year b	Using the formal column method	Using the formal column method	Using the formal column method to multiply numbers up to two decimal places by a single digit: 1.32 $x = \frac{4}{5.28}$	748 ÷ 51 = 14 74 ÷ 51 = 1 remainder 23 51)748 Subtract (1 group of) 51 from 74 Write 1 above the 4 in 748 Write the remainder underneath Bring the 8 down from 748 -204 Write it next to 23 34 238 ÷ 51 = 4 remainder 34 (Use approximation for this e.g. 4 x 50 = 200 so 4 x 51 = 204 Subtract (4 groups of 51) 204 from 238 Write 4 above the 8 in 748 Write the remainder underneath Finding a decimal remainder using the long division method: 748 ÷ 51 14.66 51 748.00 - $\frac{51}{238}$ - $204$ $\frac{34!8}{34!8}$ - $30.6$ $\frac{3.06}{3.240}$		