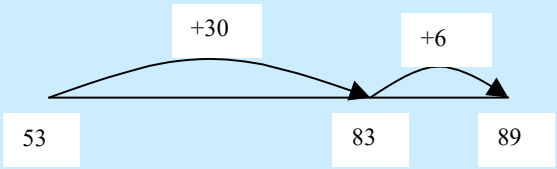
Key Stage 1

Year		Mental calculation	Written Calculation	Essentials
	Overview of KS1	Children in Years 1 and 2 will be given a really solid foundation in the basic building blocks of mental and written arithmetic. Through being taught place value, they will develop an understanding of how numbers work, so that they are confident in 2-digit numbers and beginning to read and say numbers above 100. A focus on number bonds, first via practical hands-on experiences and subsequently using memorisation techniques, enables a good grounding in these crucial facts, and ensures that all children leave Y2 knowing the pairs of numbers which make all the numbers up to 10 at least. They will also have experienced and been taught pairs to 20. Their knowledge of number facts enables them to add several single-digit numbers, and to add/subtract a single digit number to/from a 2-digit number. Another important conceptual tool is their ability to add/subtract 1 or 10, and to understand which digit changes and why. This understanding is extended to enable children to add and subtract multiples of ten to and from any 2-digit number. The most important application of this knowledge is their ability to add or subtract any pair of 2-digit numbers by counting on or back in tens and ones. Children may extend this to adding by partitioning numbers into tens and ones. Children will be taught to count in 2s, 3s, 5s and 10s, and will have related this skill to repeated addition. They will have met and begun to learn the associated 2x, 3x, 5x and 10x tables. Engaging in a practical way with the concept of repeated addition and the use of arrays enables children to develop a preliminary understanding of multiplication, and asking them to consider how many groups of a given number make a total will introduce them to the idea of division. They will also be taught to double and halve numbers, and will thus experience scaling up or down as a further aspect of multiplication and division. Fractions will be introduced as numbers and as operators, specifically in relation to halves, quarters and thirds.		

Year		Mental calculation	Written Calculation	Essentials
Year 1	*Addition*	Number bonds (5, 6, 7, 8, 9 and 10) Count on in ones from a given 2-digit number Add two single-digit numbers Add three single-digit numbers spotting doubles or pairs to 10 Count on in tens from any given 2-digit number Add 10 to any given 2-digit number Use number facts to add single-digit numbers to two-digit numbers, e.g. use 4 + 3 to work out 24 + 3, 34 + 3… Add by putting the larger number first		Pairs with a total of 10 Counting in ones Counting in tens Count on 1 from any given 2-digit number
	Subtraction	Number bonds (5, 6, 7, 8, 9 and 10) Count back in ones from a given 2-digit number Subtract one single-digit number from another Count back in tens from any given 2-digit number Subtract 10 from any given 2-digit number Use number facts to subtract single-digit numbers from two-digit numbers, e.g. use 7 – 2 to work out 27 – 2, 37 – 2…		Number bonds to 10 Counting back in ones from 20 to 0 Counting back in tens from 100 to 0 Count back 1 from any given 2-digit number

Year		Mental calculation	Written Calculation	Essentials
Year 2	*Addition*	Number bonds – to 12 and then 20. Count on in ones and tens from any given 2-digit number Add two or three single-digit numbers Add a single-digit number to any 2-digit number using number facts, including bridging multiples of 10. (E.g. 45 + 4, and bridging, 38 + 7) Add 10 and small multiples of 10 to any given 2-digit number (E.g. 26 + 20 = 46) Add any pair of 2-digit numbers	**+ = signs and missing numbers** Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers. **Partition into tens and ones** • Count on by partitioning the second number only e.g. 36 + 53 = 53 + 30 + 6 = 83 + 6 = 89  	Know number bonds to 10 Add two single digit numbers Add a single-digit number to a 2-digit number by counting on in ones Add 10 and small multiples of 10 to a 2-digit number by counting on in tens
	Subtraction	Number bonds – knowing all the pairs of numbers which make all the numbers to 12 Count back in ones and tens from any given 2-digit number Subtract a single-digit number from any 2-digit number using number facts, including bridging multiples of 10, e.g. 56 – 3, 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 tens and ones or by counting up.		Know pairs of numbers which make each total up to 10 Subtract a single-digit number from a 2-digit number by counting back in ones Subtract 10 and small multiples of 10 from a 2-digit number by counting back in tens

Lower Key stage 2

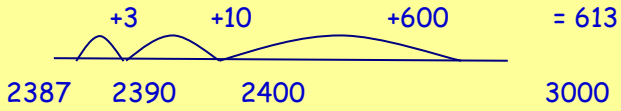
	Overview of LKS2	In the lower juniors, children build on the concrete and conceptual understandings they have gained in the Infants to develop a real mathematical understanding of the four operations, in particular developing arithmetical competence in relation to larger numbers. In addition and subtraction, they are taught to use place value and number facts to add and subtract numbers mentally and will develop a range of strategies to enable them to discard the 'counting in ones' or fingers-based methods of the infants. In particular, they will learn to add and subtract multiples and near multiples of 10, 100 and 1000, and will become fluent in complementary addition as an accurate means of achieving fast and accurate answers to 3-digit subtractions. Standard written methods for adding larger numbers are taught, learned and consolidated, and written column subtraction is also introduced. This key stage is also the period during which all the multiplication and division facts are thoroughly memorised, including all facts up to the 12 x 12 table. Efficient written methods for multiplying or dividing a 2-digit or 3-digit number by as single-digit number are taught, as are mental strategies for multiplication or division with large but friendly numbers, e.g. when dividing by 5 or multiplying by 20. Children will develop their understanding of fractions, learning to reduce a fraction to its simplest form as well as finding non-unit fractions of amounts and quantities. The concept of a decimal number is introduced and children consolidate a firm understanding of one-place decimals, multiplying and dividing whole numbers by 10 and 100.

Year 3	***Addition***	Add any pair of 2-digit numbers Know number bonds to 20 Know number bonds with a total of 100 (multiples of 10) 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 and 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 column addition to add numbers with two and three digits. Begin to add like fractions. (E.g. $^3/_8 + {}^1/_8 + {}^1/_8$) Recognise fractions that add to 1. (E.g. $\frac{1}{4} + \frac{3}{4}$ or $^3/_5 + {}^2/_5$)	Know number bonds to 10, and then 20 Add two 2-digit numbers by counting on in tens and ones (E.g. 56 + 35 is 56 + 30 and then add the 5) Understand simple place value additions: 200 + 40 + 5 = 245 Use place value to add multiples of 10 or 100
	Subtraction	Number bonds to 20 Find the difference between any two 2-digit numbers Perform place value subtractions without a struggle. (E.g. 536 – 30 = 506, etc.) Subtract 2-digit numbers from numbers >100 by counting up. (E.g. 143 – 76 is done by starting at 76, 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 three-digit numbers, e.g. 423 – 357 is +3 +40 +23 = 66  357 360 400 423 Begin to subtract like fractions. (E.g. $^7/_8 - {}^3/_8$)	

Year 4	***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 hundred, pound and whole number. (E.g. 234 + 66 = 300, 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. 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 total is 4160)	Column addition for 3-digit and 4-digit numbers 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. $^2/_3 + ? = 1$)	Add any 2-digit numbers by partitioning or counting on Number bonds to 20 Know pairs of multiples of 10 with a total of 100 Add friendly larger numbers using knowledge of place value and number facts Use expanded column addition to add 3-digit numbers
	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, etc.) Subtract multiples and near multiples of 10, 100 and 100 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 column subtraction for 3-digit and 4-digit numbers 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 is +5 +30 +102 = 137  1865 1870 1900 2002 Subtract like fractions, e.g. $\frac{1}{4} + {}^1/_8 = {}^3/_8$ Use fractions that add to 1 to find fraction complements to 1, e.g. $1 - {}^2/_3 = {}^1/_3$	Use counting up with confidence to solve most subtractions, including finding complements to multiples of 100. (E.g. 512 – 287 is done by) +3 +10 +100 +100 +12 = 225  287 290 300 400 500 512 67 + ? = 100 +3 +30 = 33  67 70 100

Upper Key stage 2

	Overview of LKS2	children move on from dealing mainly with whole numbers to performing arithmetic operations with both decimals and fractions. They will consolidate their use of written procedures in adding and subtracting whole numbers with up to 6 digits and also decimal numbers with up to two decimal places. Mental strategies for adding and subtracting increasingly large numbers will also be taught. These will draw upon children's robust understanding of place value and knowledge of number facts. Efficient and flexible strategies for mental multiplication and division are taught and practised, so that children can perform appropriate calculations even when the numbers are large, such as 40,000 x 6 or 40,000 ÷ 8. In addition, it is in Y5 and Y6 that children extend their knowledge and confidence in using written algorithms for multiplication and division. Fractions and decimals are also added, subtracted, divided and multiplied, within the bounds of children's understanding of these more complicated numbers, and they will also calculate simple percentages and ratios. Negative numbers will be added and subtracted.

Year 5	***Addition***	Know numbers bonds to 1 and to the next whole number (E.g. 0.6 + __ = 1, 0.06 + __ = 1) Add to the next 10 from a decimal number, *e.g. 13·6 + 6·4 = 20* Add numbers with two significant digits only, using mental strategies. (E.g. 3.4 + 4.8 or 23,000 + 47,000) Add one or two-digit multiples of 10, 100, 1000, 10,000 and 100,000. (E.g. 8000 + 7000 or 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 or £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, 0.6 + 0.7 + 0.4, or 2,056 + 44)	Use column addition to add two or three whole numbers with up to 5 digits Use column addition to add any pair of two-place decimal numbers including amounts of money. Begin to add related fractions using equivalences. (E.g. $\frac{1}{2} + {}^{1}/_{6} = {}^{3}/_{6} + {}^{1}/_{6}$) Choose the most efficient method in any given situation	Add numbers with only 2-digits which are not zeros, e.g. 3.4 + 5.8 Derive swiftly and without any difficulty number bonds to 100 Add friendly large numbers using knowledge of place value and number facts Use column addition to add pairs of 4- and 5-digit numbers
	Subtraction	Subtract numbers with two significant digits only, using mental strategies. (E.g. 6.2 – 4.5 or 72,000 – 47,000) Subtract one or two-digit multiples of 100, 1000, 10,000 and 100,000. (E.g. 8000 – 3000 or 600,000 – 200,000) Subtract one or two digit near multiples of 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 or £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 or 1000 – 782] Recognise fraction complements to 1 and to the next whole number. (E.g. $1\ {}^{2}/_{5} + {}^{3}/_{5} = 2$) 4 – 5	Use compact column subtraction to subtract numbers with up to 5 digits. Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000. Use complementary addition for subtractions of decimals with up to two places incl. amounts of money Begin to subtract related fractions using equivalences. (E.g. $\frac{1}{2} - {}^{1}/_{6} = {}^{2}/_{6}$) Choose the most efficient method in any given situation	Derive swiftly and without difficulty number bonds to 100 Use counting up with confidence mentally to solve appropriate subtractions, including finding complements to multiples of 1000. (E.g. 3000 – 2387 is done by 

Year 6	***Addition***	Know by heart number bonds to 100 and use these to derive related facts. (E.g. 3.46 + 0.54 = 4) 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 calculation do-able 'in our heads'. (E.g. 34,000 + 8000.) 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 or 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	Use column addition to add numbers with up to 5 digits. Use column addition to add decimal numbers with up to 3-digits Add mixed numbers and fractions with different denominators.	Derive swiftly and without difficulty, number bonds to 100 Use place value and number facts to add friendly large or decimal numbers, e.g. 3.4 + 6.6 or 26,000 + 5,400 Use column addition to add numbers with up to 4-digits. Use column addition to add pairs of two-place decimal numbers.
	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 one-place or two-place decimal numbers using complementary addition and including money. (E.g. 10 – 3.65 as 0.35 + 6, £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 two places. (E.g. 467,900 – 3,005 or 4.63 – 1.02) Subtract negative numbers in a context such as temperature where the numbers make sense.	Use column subtraction to subtract numbers with up to 6 digits. Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000 or 10,000. Use complementary addition for subtractions of decimal numbers with up to three places including money. Subtract mixed numbers and fractions with different denominators.	Use number bonds to 100 to perform mental subtraction of numbers up to 1000 by complementary addition. (E.g. 1000 – 654 as 46 + 300 in our heads.) Use complementary addition for subtraction of integers up to 10,000. E.g. 2504 – 1878 as +2 +20 +100 +504 = 626  1878 1880 1900 2000 2504 Use complementary addition for subtractions of one-place decimal numbers and amounts of money. (E.g. £7.30 – £3.55 as +5p +40p +£3.30 = £3.75  £3.55 £3.60 £4.00 £7.30

Mathematics Appendix 1: Examples of formal written methods for addition, subtraction, multiplication and division

This appendix sets out some examples of formal written methods for all four operations to illustrate the range of methods that could be taught. It is not intended to be an exhaustive list, nor is it intended to show progression in formal written methods. For example, the exact position of intermediate calculations (superscript and subscript digits) will vary depending on the method and format used.

For multiplication, some pupils may include an addition symbol when adding partial products. For division, some pupils may include a subtraction symbol when subtracting multiples of the divisor.

Addition and subtraction

789 + 642 becomes

$$\begin{array}{r} 7\ 8\ 9 \\ +\ 6\ 4\ 2 \\ \hline 1\ 4\ 3\ 1 \\ \hline {\scriptstyle 1\ \ 1} \end{array}$$

Answer: 1431

874 – 523 becomes

$$\begin{array}{r} 8\ 7\ 4 \\ -\ 5\ 2\ 3 \\ \hline 3\ 5\ 1 \end{array}$$

Answer: 351

932 – 457 becomes

$$\begin{array}{r} {\scriptstyle 8\ \ 12\ \ 1} \\ 9\ \not{3}\ \not{2} \\ -\ 4\ 5\ 7 \\ \hline 4\ 7\ 5 \end{array}$$

Answer: 475

932 – 457 becomes

$$\begin{array}{r} {\scriptstyle 1\ \ 1} \\ 9\ 3\ 2 \\ -\ \not{4}\ \not{5}\ 7 \\ {\scriptstyle 5\ \ 6} \\ \hline 4\ 7\ 5 \end{array}$$

Answer: 475