MATHS CALCULATION POLICY

This policy was adopted: Autumn 2015
This policy will be reviewed: As required

Godalming Junior School has adopted the exemplar calculation policy from the Hamilton Trust as this is a resource we use to assist us in our planning and teaching of maths throughout the school.

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***	Know pairs with each total to 20 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 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 expanded column addition to add two or three 3-digit numbers or three 2-digit numbers Begin to use compact column addition to add numbers with three digits. Begin to add like fractions. (E.g. $^3/_8 + {}^1/_8 + {}^1/_8$) Recognise fractions that add to 1. (E.g. ¼ + ¾ or $^3/_5 + {}^2/_5$)	Know pairs of numbers which make each total up to 10, and which total 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

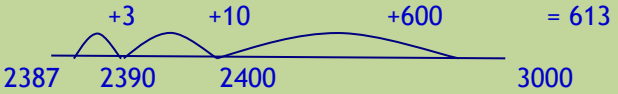
Subtraction	Know pairs with each total to 20 Subtract any two 2-digit numbers Perform place value subtractions without a struggle. (E.g. 536 – 30 = 506, etc.) Subtract 2-digit numbers from numbers >100 by counting up. (E.g. 143 – 76 is done by starting at 76, add 4 (80) then add 20 (100) then add 43 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. $^{7}/_{8}$ - $^{3}/_{8}$)	Know pairs of numbers which make each total up to 10, and which total 20 Count up to subtract 2-digit numbers: 72 – 47 is +3 +10 +10 +2 = 25 47 50 60 70 72 Subtract multiples of 5 from 100 by counting up +5 +60 = 65 35 40 100 Subtract multiples of 10 and 100
Multiplication	Know by heart all the multiplication facts in the 2x, 3x, 4x, 5x, 8x and 10x 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 x 5 is 15 x 10) Partition teen numbers to multiply by a single-digit number. (E.g. 3 x 14 as 3 x 10 and 3 x 4) Double numbers up to 50	Use partitioning (grid multiplication) to multiply 2-digit and 3-digit numbers by 'friendly' single digit numbers.	Know by heart the 2x, 3x, 5x and 10x tables Double given tables facts to get others Double numbers up to 25 and multiples of 5 to 50
Division	Know by heart all the division facts derived from the 2x, 3x, 4x, 5x, 8x and 10x 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 tenth multiple, including those with remainders. (E.g. 57 ÷ 3 is 10 + 9 as 10x3=30 and 9x3=27) Halve even numbers to 100, halve odd numbers to 20	Perform divisions just above the 10th multiple using the written layout 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	Know by heart the division facts derived from the 2x, 3x, 5x and 10x tables Halve even numbers up to 50 and multiples of ten to 100 Perform divisions within the tables including those with remainders, e.g. 38 ÷ 5.

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 expanded 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. ¼ + $^1/_8$ = $^3/_8$ 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

	Multiplication	Know by heart all the multiplication facts up to 12 x 12. Recognise factors up to 12 of two-digit numbers. Multiply whole numbers and one-place decimals by 10, 100, 1000 Multiply multiples of 10, 100, 1000 by single digit numbers. (E.g. 300 x 6 or 4000 x 8) Use understanding of place value and number facts in mental multiplication. (E.g. 36 x 5 is half of 36 x 10 and 50 x 60 = 3000) Partition 2-digit numbers to multiply by a single-digit number mentally. (E.g. 4 x 24 as 4 x 20 and 4 x 4) Multiply near multiples using rounding. (E.g. 33 x 19 as 33 x 20 – 33) Find doubles to double 100 and beyond using partitioning Begin to double amounts of money. (E.g. £35.60 doubled = £71.20.)	Use a vertical written method to multiply a one-digit by a 3-digit number (ladder) Use an efficient written method to multiply a 2-digit number by a number between 10 and 20 by partitioning (grid method)	Know by heart multiplication tables up to 10 x 10 Multiply whole numbers by 10 and 100 Use grid method to multiply a 2-digit or a 3-digit number by a number up to and including 6
	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 one decimal place 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 double 245 ÷ 10) Divide larger numbers mentally by subtracting the 10^{th} or 20^{th} multiple as appropriate. (E.g. 156 ÷ 6 is 20 + 6 as 20x6=120 and 6x6=36) Find halves of even numbers to 200 and beyond using partitioning Begin to halve amounts of money. (E.g. Half of £52.40 = £26.20)	Use a written method to divide a 2-digit or a 3-digit number by a single-digit number. Give remainders as whole numbers. Begin to reduce fractions to their simplest forms. Find unit and non-unit fractions of larger amounts.	Know by heart all the division facts up to 100 ÷ 10. Divide whole numbers by 10 and 100 to give whole number answers or answers with one decimal place Perform divisions just above the 10^{th} multiple using the written layout and understanding how to give a remainder as a whole number. Find unit fractions of amounts

Upper Key stage 2

	Overview of UKS2	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 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. ½ + $^1/_6$ = $^3/_6$ + $^1/_6$) 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 expanded 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 or expanded 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. $½ - {}^{1}/_{6} = {}^{2}/_{6}$) Choose the most efficient method in any given situation	Derive swiftly and without difficulty number bonds to 100 Use counting up with confidence to solve most subtractions, including finding complements to multiples of 1000. (E.g. 3000 – 2387 is done by 
	Multiplication	Know by heart all the multiplication facts up to 12 x 12. Multiply whole numbers and one-and two-place decimals by 10, 100, 1000, 10,000 Use knowledge of factors and multiples in multiplication. (E.g. 43 x 6 is double 43 x 3, and 28 x 50 is ½ of 28 x 100 = 1400) Use knowledge of place value and rounding in mental multiplication. (E.g. 67 x 199 as 67 x 200 – 67) Use doubling and halving as a strategy in mental multiplication. (E.g. 58 x 5 = half of 58 x 10, and 34 x 4 is 34 doubled twice) Partition 2-digit numbers, including decimals, to multiply by a single-digit number mentally. (E.g. 6 x 27 as 6 x 20 (120) plus 6 x 7 (42) making 162 or 6.3 x 7 as 6 x 7 plus 0.3 x 7) Double amounts of money by partitioning. (E.g. £37.45 doubled = £37 doubled (£74) plus 45p doubled (90p) £74.90)	Use short multiplication to multiply a 1-digit number by a number with up to 4 digits Use long multiplication to multiply 3-digit and 4-digit number by a number between 11 and 20 Choose the most efficient method in any given situation Find simple percentages of amounts 9e.g. 10%, 5%, 20%, 155 and 50%) Begin to multiply fractions and mixed numbers by whole numbers ≤ 10, e.g. $4 \times {}^{2}/_{3} = {}^{8}/_{3} = 2^{2}/_{3}$.	Know multiplication tables to 11 x 11 Multiply whole numbers and one-place decimals by 10, 100 and 1000 Use knowledge of factors as aids to mental multiplication. (E.g. 13 x 6 = double 13 x 3 and 23 x 5 is ½ of 23 x 10) Use grid method to multiply numbers with up to 4-digits by one-digit numbers. Use grid method to multiply 2-digit by 2-digit numbers.

	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) x 2) Use knowledge of multiples and factors, also tests for divisibility ,in mental division. (E.g. 246 ÷ 6 is 123 ÷ 3 and we know that 525 divides by 25 and by 3) Halve amounts of money by partitioning. (E.g. Half of £75.40 = half of £75 (37.50) plus half of 40p (20p) which is £37.70) Divide larger numbers mentally by subtracting the 10^{th} or 100^{th} multiple as appropriate. (E.g. 96 ÷ 6 is 10 + 6, as 10 × 6 = 60 and 6 × 6 = 36; 312 ÷ 3 is 100 + 4 as 100 x 3 = 300 and 4 x 3 = 12) Reduce fractions to their simplest form.	Use short division to divide a number with up to 4 digits by a number ≤12. 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	Know by heart division facts up to 121 ÷ 11 Divide whole numbers by 10, 100 or 1000 to give answers with up to one decimal place. Use doubling and halving as mental division strategies Use efficient chunking to divide numbers ≤ 1000 by 1-digit numbers. Find unit fractions of 2 and 3-diigt numbers
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 multiples of powers of ten 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 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 multiples of powers of ten and near multiples of the same. 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

	Multiplication	Know by heart all the multiplication facts up to 12 x 12. Multiply whole numbers and decimals with up to three places by 10, 100 or 1000, e.g. 234 x 1000 = 234,000 and 0.23 x 1000 = 230) Identify common factors, common multiples and prime numbers and use factors in mental multiplication. (E.g. 326 x 6 is 652 x 3 which is 1956) Use place value and number facts in mental multiplication. (E.g. 40,000 x 6 = 24,000 and 0.03 x 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 x 25 is ¼ of 28 x 100 = 700) Use rounding in mental multiplication. (34 x 19 as (20 x 34) – 34) Multiply one and two-place decimals by numbers up to and including 10 using place value and partitioning. (E.g. 3.6 x 4 is 12 + 2.4 or 2.53 x 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 a 1-digit number by a number with up to 4 digits Use long multiplication to multiply a 2-digit by a number with up to 4 digits Use short multiplication to multiply a 1-digit number by a number with one or two decimal places, including amounts of money. Multiply fractions and mixed numbers by whole numbers. Multiply fractions by proper fractions. Use percentages for comparison and calculate simple percentages.	Know by heart all the multiplication facts up to 12 x 12. Multiply whole numbers and one-and two-place decimals by 10, 100 and 1000. Use an efficient written method to multiply a one-digit or a teens number by a number with up to 4-digits by partitioning (grid method). Multiply a one-place decimal number up to 10 by a number ≤100 using grid method.

	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 three decimal places. Identify common factors, common multiples and prime 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, e.g. to divide by 2, 4, 8, 5, 20 and 25. (E.g. 628 ÷ 8 is halved three times: 314, 157, 78.5) Divide one and two place decimals by numbers up to and including 10 using place value. (E.g. 2.4 ÷ 6 = 0.4 or 0.65 ÷ 5 = 0.13, £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 Use long division to divide 3-digit and 4-digit numbers by 'friendly' 2-digit numbers. Give remainders as whole numbers or as fractions or as decimals Divide a one-place or a two-place decimal number by a number ≤ 12 using multiples of the divisors. Divide proper fractions by whole numbers.	Know by heart all the division facts up to 144 ÷ 12. Divide whole numbers by 10, 100, 1000 to give whole number answers or answers with up to two decimal places. Use efficient chunking involving subtracting powers of 10 times the divisor to divide any number of up to 1000 by a number ≤ 12. (E.g. 836 ÷ 11 as 836 – 770 (70x11) leaving 66 which is 6x11. So that we have 70 + 6 = 76 as the answer). Divide a one-place decimal by a number ≤10 using place value and knowledge of division facts. .