

**Willington Lower School**

**Draft Calculation Policy**

 **The Aims of the curriculum:**

The national curriculum for mathematics aims to ensure that all pupils:

become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

**reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language

can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

**Recording**

Recording is developed in a range of ways, including the following. Although initially they will be developed in this order, once a way of recording, such as ‘by showing real objects’, is in place, that will continue to be used throughout the school; the pupils should be encouraged to complete calculations independently using the most appropriate way of doing so.

* by showing real objects
* by photographing or drawing the calculation activity
* counting on a number line
* a practical calculation activity on a number line
* a number bond on a number line
* a mental calculation on a number line
* a practical activity as a number sentence
* a number bond as a number sentence
* a mental calculation as a number sentence
* a written calculation

Our calculation policy is based on the draft Hamilton and Abacus calculation policy

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| EYFS |  | Mental calculation | Written calculation | Default for all children  |
|  | Overview of EYFS | The 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 involved in addition and subtraction. 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 begin to relate subtraction to taking away and counting how many objects are left. The children will begin to record in the context of play or practical activities and problems. The children will use real life contexts and practical equipment to count in repeated groups of the same size. The children will begin to share objects into equal groups and use the related vocabulary to describe this activity. They will learn to record these activities in a way that makes sense to them. This will be by showing or taking photographs of the equipment they have used, leading to drawings of what they did. Some children may be ready to record numerals at the end of the summer term in Year R, but probably not until in Year 1. |
|  | Addition  | Count in ones to at least 20 Count in unison to 100 place numbers in order and say which is one more than a given number to 20 Use games, songs and practical activities to begin using the vocabulary of addition use quantities and objects to add two single digit numbers and count on to find the answer know the story of 6 (3+3, 2+4, 1+5, 6+0), and the stories of 5 and of 4 and of 3 solve problems involving doubling begin to compare numbers  | by showing real objects by photographing or drawing the calculation activity record using marks that they can interpret and explain | Count in ones to 20 match one-to-one in counting subitise numbers up to and including 6 match numbers to fingers without counting know the number one more than a given number to 12  |
|  | Subtraction  | Count back in ones from 20 say which number is one less than a given number to 20 use games, songs and practical activities to begin using the vocabulary of subtraction use quantities and objects to subtract one single digit number from another single digit number and counting how many objects are left know the story of 6 (3+3, 2+4, 1+5, 6+0), and the stories of 5 and of 4 and of 3 solve problems involving halving  | by showing real objects by photographing or drawing the calculation activity record using marks that they can interpret and explain | Count back in ones from 20 know the number one less than a given number to 12  |

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|  |  | Mental calculation  | Written calculation | Default for all children  |
|  | multiplication | Chanting in unison in two’s, fives and tens using real life objects and practical equipment to count in repeated groups of the same size use the related vocabulary | by showing real objects by photographing or drawing the calculation activity record using marks that they can interpret and explain | Chanting in unison in two’s, fives and tens solve problems involving grouping   |
|  | Division  | Share objects into equal groups use the related vocabulary  | by showing real objects by photographing or drawing the calculation activity record using marks that they can interpret and explain | Solve problems involving sharing |

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**Key Stage 1**

| **Year** |  | **Mental calculation** | **Written Calculation** | **Default for ALL children** |
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|  | ***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. |
|  |  | **Mental calculation** | **Written Calculation** | **Default for ALL children** |
| **Year 1****Year 1** | ***Addition*** | Number bonds (‘story of’ 5, 6, 7, 8, 9 and 10)Count on in ones from a given 2-digit numberAdd two single-digit numbers Add three single-digit numbers spotting doubles or pairs to 10Count on in tens from any given 2-digit number Add 10 to any given 2-digit numberUse 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 | 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, etc.They use number lines and practical resources such as Numicon 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 can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3. | Pairs with a total of 10 Counting in onesCounting in tens Count on 1 from any given 2-digit number |
|  ***Subtraction*** | Number bonds (‘story of’ 5, 6, 7, 8, 9 and 10)Count back in ones from a given 2-digit numberSubtract one single-digit number from anotherCount back in tens from any given 2-digit numberSubtract 10 from any given 2-digit numberUse number facts to subtract single-digit numbers from two-digit numbers, e.g. use 7 – 2 to work out 27 – 2, 37 – 2… |  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, etc.They use number lines and practical resources such as Numicon 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. | Pairs with a total of 10 Counting back in ones from 20 to 0Counting back in tens from 100 to 0Count back 1 from any given 2-digit number |
| ***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 | 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. | Begin to count in 2s and 10s Double numbers to 5 using fingers |
| ***Division*** | Begin to count in 2s, 5s and 10sFind half of even numbers to 12 and know it is hard to halve odd numbersFind half of even numbers by sharingBegin to use visual and concrete arrays or ‘sets of’ to find how many sets of a small number make a larger number. | 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. | Begin to count in 2s and 10sFind half of even numbers by sharing |
| **Year 2****Year 2****Year 2** | ***Addition*** | Number bonds – knowing all the pairs of numbers which make all the numbers to 12, and pairs with a total of 20Count on in ones and tens from any given 2-digit numberAdd 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, 38 + 7)Add 10 and small multiples of 10 to any given 2-digit numberAdd any pair of 2-digit numbers | Children will begin to use ‘empty number lines’ themselves starting with the larger number and counting on;First counting on in tens and ones.Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).Followed by adding the tens in one jump and the units in one jump.Bridging through ten can help children become more efficient. | Know pairs of numbers which make each total up to 10Add two single digit numbersAdd a single-digit number to a 2-digit number by counting on in onesAdd 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 12Count back in ones and tens from any given 2-digit numberSubtract 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 numberSubtract any pair of 2-digit numbers by counting back in tens and ones or by counting up.  | Children will begin to use empty number lines to support calculations. First counting back in tens and ones. Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).Subtracting the tens in one jump and the units in one jump.Bridging through ten can help children become more efficient.If the numbers involved in the calculation are close together or near to multiples of 10, 100 etc. it can be more efficient to count on.Count up from the smaller number to the larger number in jumps of 10 and jumps of 1.The number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with ‘taking away’. | Know pairs of numbers which make each total up to 10Subtract a single-digit number from a 2-digit number by counting back in onesSubtract 10 and small multiples of 10 from a 2-digit number by counting back in tens |
| ***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 x 4 is three rows of 4 dots)Begin to learn the 2x, 3x, 5x and 10x tables, seeing these as ‘lots of’, e.g. 5 lots of 2, 6 lots of 2, 7 lots of 2, etc. Double numbers up to 20Begin to double multiples of 5 to 100Begin to double two-digit numbers less than 50 with 1s digits of 1, 2, 3 4 or 5  | Children will develop their understanding of multiplication and use jottings to support calculation:**Repeated addition**3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3 Repeated addition can be shown easily on a number line; and on a bead string 5 x 3 = 5 + 5 + 5Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.**Arrays**Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method. | Count in 2s, 5s and 10sBegin to use and understand simple arrays, e.g. 2 x 4 is two lots of four buns. Double numbers up to 10Double multiples of 10 to 50 |
| ***Division*** | Count in 2s, 5s and 10sBegin to count in 3sUsing 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 twos.) Relate division to grouping. (E.g. how many groups of five in fifteen?) Halve numbers to 20Begin to halve numbers to 40 and multiples of 10 to 100Find ½, 1/3, ¼ and ¾ of a quantity of objects and of amounts (whole number answers) | Children will develop their understanding of division and use jottings to support calculation **Sharing equally****Grouping or repeated subtraction****Repeated subtraction using a number line****Using symbols to stand for unknown numbers to complete equations using inverse operations** | Count in 2s, 5s and 10sSay how many rows in a given array. (E.g. how many rows of 5 in an array of 3 x 5) Halve numbers to 12Find ½ of amounts |

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**Lower Key stage 2**

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|  | ***Overview of LKS2*** | In year 3 and 4, children build on the concrete and conceptual understandings they have gained in key stage 1 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 KS1. 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 20Know pairs of multiples of 10 with a total of 100Add any two 2-digit numbers by counting on in 10s and 1s or by using partitioningAdd multiples and near multiples of 10 and 100Perform 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 numbersBegin 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 20Add 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 = 245Use place value to add multiples of 10 or 100 |
| ***Subtraction*** | Know pairs with each total to 20Subtract any two 2-digit numbersPerform 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 100Subtract, 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 = 66357 360 400 423Begin to subtract like fractions. (E.g. 7/8 - 3/8)  | Know pairs of numbers which make each total up to 10, and which total 20Count up to subtract 2-digit numbers: 72 – 47 is  +3 +10 +10 +2 = 25 47 50 60 70 2Subtract multiples of 5 from 100 by counting up  +5 +60 = 65 35 40 100Subtract 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 100Recognise that multiplication is commutativeUse 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 | Children will continue to use repeated addition and should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.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 answersRecognise 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 onKnow by heart/quickly derive number bonds to 100 and to £1Add 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 moneyUse 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 onNumber bonds to 20Know pairs of multiples of 10 with a total of 100Add 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 numbersKnow by heart/quickly derive number bonds to 100Perform place value subtractions without a struggle. (E.g. 4736 – 706 = 4030, etc.)Subtract multiples and near multiples of 10, 100 and 100Subtract 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 moneyFind 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 = 1371865 1870 1900 2002Subtract like fractions, e.g. ¼ + 1/8 = 3/8Use 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 = 225287 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, 1000Multiply 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 partitioningBegin 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 10Multiply whole numbers by 10 and 100Use 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 placeDivide 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 10th or 20th 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 partitioningBegin 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 10th multiple using the written layout and understanding how to give a remainder as a whole number. Find unit fractions of amounts |