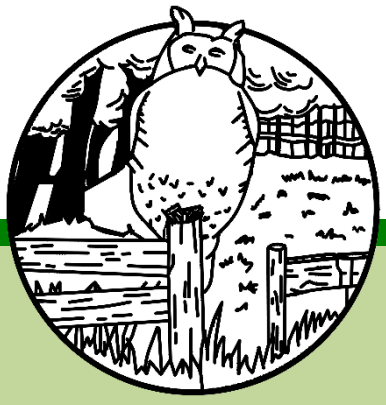
Addition Curriculum



Woodland Grange Primary School

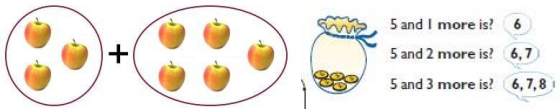
Aiming high to achieve excellence and success by working together.

ADDITION: Y1

Understanding the operation

Understand addition as:

- Combining two or more quantities.
- Increasing one quantity.



Read, write and interpret mathematical statements involving addition (+) and equals (=) sign.

14+5=19 17=9+8

Solve missing number problems

11+☐=18 ☐=13+2 13=☐+☐

Understand addition and subtraction as related operations. E.g. 7 + 3 = 10 is related to 10 – 3 = 7

When introduced to the equals sign, children should see it as signifying equality. They should become used to seeing it in different positions.

Vocabulary

Understand the vocabulary related to addition:

Addition, add (+), forwards, put together, more than, total, altogether, distance between, difference

Number facts

Recall and use addition facts to 10 fluently

the total of 6 and 3 6 plus 2 4 more than 5

Know number pairs with a total of 20

16+☐ = 20 20 = 3+☐

Mental methods and jottings

Add one-digit and two-digit numbers to 20, including zero using concrete objects, pictorial representation and mentally.

Represent and use number bonds within 20, experiencing the = sign in different positions.

Counting on (sequencing)

12 + 3 (by counting on in ones; 13, 14, 15)

With Jottings:

Progress to crossing the tens boundary

18 + 5 (by partitioning 5 to bridge the tens boundary; + 2, + 3)

Partitioning

5 + 7 (by partitioning 7 in to 5 and 2)

5 + 5 + 2

Use bundles of straws and Dienes to model partitioning teen numbers into tens and ones and develop their understanding of place value.

Children have opportunities to explore partitioning numbers in different ways.

e.g. 7 = 6 + 1, 7 = 5 + 2, 7 = 4 + 3

No formal written layout. Children record their maths using pictorial representations, number lines and mathematical statements.

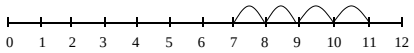
Counting and Combining sets of Objects

5+7=12

Add one-digit and two-digit numbers to 20, including

zero 7 + 4

OR



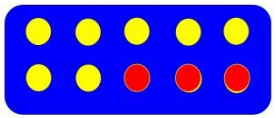
between, equals = same as, most, pattern, odd, even, digit, counting on, plus, the sum of

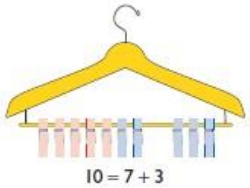
Generalisations

- True or false? Addition makes numbers bigger.
- True or false? You can add numbers in any order and still get the same answer.

Some Key Questions

How many altogether? How many more to make…? I add …more. What is the total? How many more is… than…? How much more is…? One more, two more, ten more… What can you see here?
Is this true or false?
What is the same? What is different?
Children should experience regular counting on and back from different numbers in 1s and in multiples of 2, 5 and 10.



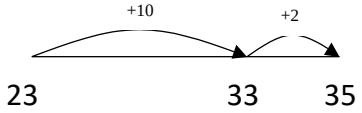
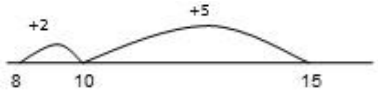
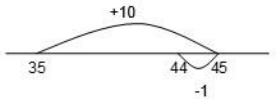


Using known facts and place value

15 + 4

5 + 4 = 9 so 15 + 4 = 19

ADDITION: Y2

Understanding the operation and related vocabulary.	Mental Calculations	Written Calculations
Understanding the operation Continue to understand addition as: - Combining two or more quantities. - Increasing one quantity. Show that addition of two numbers can be done in any order (commutative law) Recognise that 5 + 27 is equal to 27 + 5 Continue to recognise the inverse relationship between and addition and subtraction using numbers up to 20. Write the related number sentences 15+2=17 2+15=17 17=15+2 17=2+15 17-2=15 17-15=2 2=17-15 15=17-2 Solve missing number problems 17+☐=27 ☐=21+4 10=☐+☐ **Vocabulary** Understand the vocabulary related to addition +, add, addition, more, plus, make, sum, total, altogether, how many more to make…? how many more is… than…? how much more is…? =, equals, sign, is the same as, Tens, ones, partition Near multiple of 10, tens boundary, More than, one more, two more… ten more… one hundred more **Generalisation** • Noticing what happens when you count in tens	**Number facts** Recall and use number facts to 20 fluently and derive and use related facts up to 100. 7 add 8 4 more than 9 50 plus 30 the sum of 40 and 50 Know complements to the next multiple of 10. 52+☐ = 60 76+☐ = 80 Know pairs of multiples of 10 with a total of 100. 60+☐ = 100 100 = 70+☐ **Mental methods and jottings** Add numbers using concrete objects, pictorial representations, and mentally, including: • a two-digit number and ones • a two-digit number and tens • two two-digit numbers • adding three one-digit numbers **Counting on** 37 + 20 (by counting on in tens; 47, 57) With Jottings Begin by not crossing the tens boundary 42 + 23 (by partitioning the second number and counting on; + 20, + 3) Progress to crossing the tens boundary 47 + 15 (by partitioning the second number and counting on; + 10, +3, +2)	Continue to use number lines to develop understanding of: **Counting on in tens and ones** 23 + 12 = 23 + 10 + 2 = 33 + 2 = 35  **Partitioning and bridging through 10.** The steps in addition often bridge through a multiple of 10 e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5. 8 + 7 = 15  **Adding 9 or 11 by adding 10 and adjusting by 1** e.g. Add 9 by adding 10 and adjusting by 1 35 + 9 = 44  **Towards a Written Method** Partitioning in different ways and recombine

(the digits in the ones column stay the same)

- Odd + odd = even; odd + even = odd; etc
- show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. This understanding could be supported by images such as this.

$7 + ? = 10$

Some Key Questions

How many altogether? How many more to make…? How many more is… than…? How much more is…?
Is this true or false?
If I know that 17 + 2 = 19, what else do I know? (e.g. 2 + 17 = 19; 19 – 17 = 2; 19 – 2 = 17; 190 – 20 = 170 etc). What do you notice? What patterns can you see?

Partitioning

23 + 12 (20 + 10 = 30, 3 + 2 = 5 then 30 + 5 = 35)
With Jottings
Begin by not crossing the tens boundary
42 + 23 (40 + 20 = 60; 3 + 2 = 5 then 60 + 5)
Progress to crossing the tens boundary
47 + 15 (40 + 10 = 50, 7 + 5 =12 then 50 +12 = 62)

Adjusting

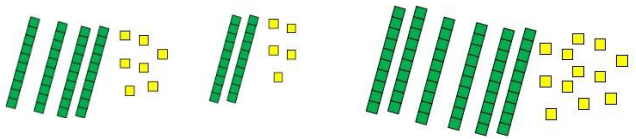
34 + 9 (adding 10 then subtracting 1)
With Jottings
45 + 19 (by adding 20 and subtracting 1)

Using known facts and place value:

63 +4
3+4=7 so 63+4=67

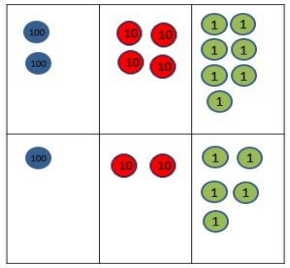
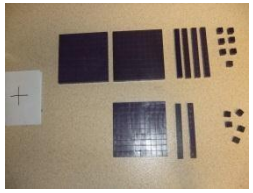
Estimating:

Check calculations by adding in a different order
check 27 + 15 (27 + 10 + 5) with 15 + 20 + 7



47 + 25 = 72

ADDITION: Y3

Understanding the operation and related vocabulary.	Mental Calculations	Written Calculations
Understanding the operation Continue to develop understanding of addition. Understand the principles of the commutative and associative law: Recognise that 45 + 36 is equal to 36 + 45 Recognise that if calculating 13 + 14 + 9 the numbers can be combined in any order Understand the inverse relationship between addition and subtraction 45+22=67 22+45=67 67=45+22 67=22+45 67-22=45 67-45=22 22=67-45 45=67-22 Solve missing number problems 62+☐=74 ☐=45+32 ☐+☐=50 100 - 3 = 67 + ☐ 45 < ☐ + 6 ☐+☐ > 54 + 9 **Vocabulary** Understand, read and spell vocabulary related to addition correctly Hundreds, tens, ones, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, rounding, column subtraction, exchange See also Y1 and Y2 **Generalisations** Noticing what happens to the digits when you count in tens and hundreds. Odd + odd = even etc (see Year 2) Inverses and related facts – develop fluency in finding related addition and subtraction facts. Develop the knowledge that the inverse relationship	**Number facts** Continue to recall and use addition facts to 20 fluently, and derive and use related facts beyond 100 7 add 9, 80 plus 70, the sum of 90 and 60, 30 more than 110 Know pairs of two-digit numbers with a total of 100 74 +☐ = 100 100 = 59 +☐ **Mental methods and jottings** Add numbers mentally, including: • a three-digit number and ones • a three-digit number and tens • a three-digit number and hundreds **Counting On (Sequencing)** 137 + 50 (by counting on in tens; 147, 157, 167, 177, 187 With Jottings: 345 + 37 (by partitioning the second number and counting on; +30, +5, +2) **Partitioning:** 236 + 33 (30+30=60, 6+3=9, 200+60+9=269) With Jottings: 236 + 85 (80+30=110, 6+5=11, 200+110+11=321) **Adjusting:** 234 + 99 (by adding 100 and subtracting 1) With Jottings: 334 + 59 (by adding 60 and subtracting 1)	**Partition into tens and ones** Partition both numbers and recombine. Count on by partitioning the second number only e.g. 247 + 125 = 247 + 100 + 20+ 5 = 347 + 20 + 5 = 367 + 5 = 372 Children need to be secure adding multiples of 100 and 10 to any three-digit number including those that are not multiples of 10. **Towards a Written Method** Introduce expanded column addition modelled with place value counters or Dienes. Add numbers with up to three digits, using formal written methods of columnar addition   leading to 247 +125 12 60 300 372

can be used as a checking method.

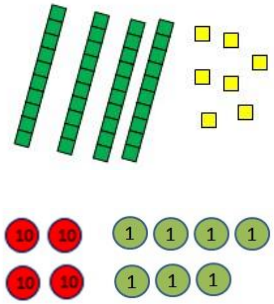
Key Questions

What do you notice? What patterns can you see?

When comparing two methods alongside each other: What's the same? What's different? Look at this number in the formal method; can you see where it is in the expanded method / on the number line?

Manipulatives can be used to support mental imagery and conceptual understanding. Children need to be shown how these images are related eg.

What's the same? What's different?



Using Known Facts And Place Value:

282 + 7

2+7=9 so 282+7= 289

Estimating:

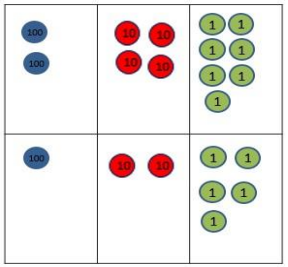
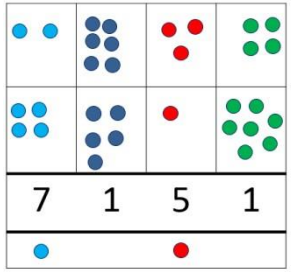
Estimate the answer to a calculation

139 + 58 is approximately 150 + 50

Use inverse operations or equivalent calculations to check answers

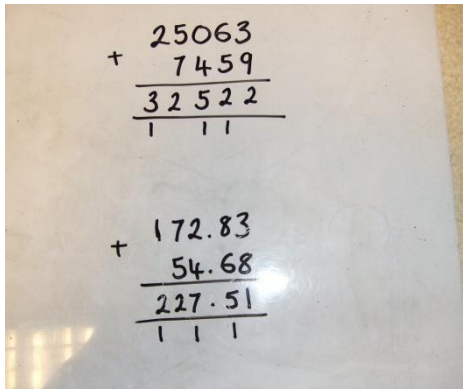
236 + 85 by adding in a different order e.g. 200 + 85 + 36

ADDITION: Y4

Understanding the operation and related vocabulary.	Mental Calculations	Written Calculations
Understanding the operation Continue to understand the principles of the commutative and associative laws Recognise that 342 + 187 is equal to 187 + 342 Recognise that if calculating 46 + 39 + 14 the numbers can be combined in any order Continue to understand the inverse relationship between addition and subtraction 256+92=348 92+256=348 348=256+92 348=92+256 348-256=92 348-92=256 92= 348-256 256=348-92 Continue to solve missing number problems 456+☐=673 ☐=300+176 ☐+☐=125 1000 - 103 = 450 + ☐ 450 < ☐ + 60 ☐+☐ > 345+199 **Vocabulary** Understand, read and spell vocabulary related to addition correctly See years 1, 2 and 3 add, addition, sum, more, plus, increase, sum, total, altogether, double, near double, how many more to make..? how much more? ones boundary, tens boundary, hundreds boundary, thousands boundary, tenths boundary, hundredths boundary, inverse, how many more/fewer? Equals sign, is the same as. **Generalisations** Investigate when re-ordering works as a strategy for subtraction. Eg. 20 – 3 – 10 = 20 – 10 – 3, but 3 – 20 –	**Number facts** Continue to use knowledge of addition facts and place value to derive related facts 5000 add 3000, 700 plus 800, the sum of 700 and 600, 300 more than 1200 Know complements to the next multiple of 100 568+☐ = 600 749+☐ = 800 Continue to practise mental methods of addition with increasingly large numbers. **Mental methods and jottings** **Counting On (Sequencing):** 534 + 150 (by partitioning the second number and counting on; +100, +50) With Jottings: 675+28 (by partitioning the second number and counting on; +25, +3) **Partitioning:** 87 + 46 (80+40=120, 7+6=13, 120+13=133) With Jottings: 456 + 362 (400+300=700, 50+60=110, 6+2=8, 700+110+8=818) **Adjusting:** 1435 + 199 (by adding 200 and subtracting 1) With Jottings: 1764+79 (by adding 80 (+40, +40) and subtracting 1) **Using Known Facts And Place Value:** 6060 + 47 60+47= 107 so 6060+47=6107	Add decimals to 2 decimal places (in the context of money or measures) **Written methods (progressing to 4-digits)** Expanded column addition modelled with place value counters, progressing to calculations with 4-digit numbers using the formal written method of columnar addition where appropriate  247 +125 12 60 300 372 **Compact written method** Extend to numbers with at least four digits.  2634 +4517 7151 Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

10 would give a different answer. **Some Key Questions** What do you notice? What's the same? What's different? Can you convince me? How do you know?	**Estimating:** Estimate the answer to a calculation 2467 + 1729 is approximately 2500 + 1500 Use inverse operation or an equivalent calculations to check answers 1764+79 by adding 80 and adjusting or by using partitioning	Extend to up to two places of decimals (same number of decimals places) and adding several numbers (with different numbers of digits). 72.8 + 54.6 127.4 1 1

ADDITION: Y5

Understanding the operation and related vocabulary.	Mental Calculations	Written Calculations
Understanding the operation Continue to solve missing number problems 6.5+☐=10.7 ☐=8.4+3.7 ☐+☐=4.2 7.3+2.9 = 9.9 + ☐ 5.2 < ☐ - 0.9 ☐ - ☐ > 7.2-1.9 Begin to use brackets (10+3) x 7 = ☐ ☐=10 + (0.4 x 8) **Vocabulary** Read, spell and pronounce mathematical vocabulary related to addition correctly tens of thousands boundary, Also see previous years **Generalisation** Sometimes, always or never true? The difference between a number and its reverse will be a multiple of 9. What do you notice about the differences between consecutive square numbers? Investigate a – b = (a-1) – (b-1) represented visually. **Some Key Questions** What do you notice? What's the same? What's different?	**Number facts** Continue to use knowledge of addition facts and place value to derive related facts with numbers to one decimal place 1.2 plus 0.7, the total of 0.8 and 0.9, the sum of 0.2 and 1.3, 0.3 more than 1.7 Know complements to 1 0.78 + ☐ = 1 0.52 + ☐ = 1 Recall pairs of three-digit numbers with a total of 1000 456 + ☐ = 1000 1000 = ☐ + 825 **Mental methods and jottings** Add numbers mentally with increasingly large numbers. Add tenths, and one-digit whole numbers and tenths. **Counting on (sequencing):** 4.3 + 1.5 (by partitioning the second number and counting on; +1, +0.5) With jottings: 19.7 + 2.6 (by partitioning the second number and counting on; +2, +0.3, +0.3) **Partitioning:** 3.6 + 1.7 (3+1=4, 0.6+0.7=1.3, 4+1.3=5.3) With jottings: 18.7 + 14.8 (18+14=32, 0.7+0.8=1.5, 32+1.5=33.5)	Add whole numbers with more than 4 digits, including using formal written methods **Written methods (progressing to more than 4-digits)** As year 4, progressing when understanding of the expanded method is secure, children will move on to the formal columnar method for whole numbers and decimal numbers as an efficient written algorithm.  Place value counters can be used alongside the columnar method to develop understanding of addition with decimal numbers.

	Adjusting: 8.3 + 1.9 (by adding 2 and subtracting 0.1) With jottings: 14.6 + 3.9 (by adding 4 and subtracting 0.1) **Using known facts and place value:** 7.5 + 2.6 7.5 + 2.5 = 10 so 7.5 + 2.6 = 10.1 **Estimating** Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy 25 063 + 7459 is approximately 25 000 + 7500 Continue to use appropriate strategies to check answers check 8.3 + 1.9 by adding in a different order 8.3 + 2 – 0.1 or 8.3 + 0.7 + 1.2	

ADDITION: Y6		
Understanding the operation and related vocabulary.	**Mental Calculations**	**Written Calculations**
Understanding the operation Use their knowledge of the order of operations. Understand that when there are no brackets in an expression, do multiplication or division before addition or subtraction. Understand that if the operations are at the same level of priority, work out the example from left to right. Continue to solve missing number problems 0.63+☐=0.85 ☐=0.5+0.33 ☐+☐=0.71 0.89 + 0.3 = 0.6 + ☐ 0.75 < ☐ + 0.06 ☐ + ☐ > 0.74 + 0.07 Explore the order of operations using brackets compare 14 – (3 + 5) with (14 – 3) + 5 **Vocabulary** See previous years Read, spell and pronounce mathematical vocabulary related to addition correctly **Generalisations** Order of operations: brackets first, then multiplication and division (left to right) before addition and subtraction (left to right). Children could learn an acrostic such as PEMDAS, or could be encouraged to design their own ways of remembering. Sometimes, always or never true? Subtracting numbers makes them smaller.	**Number facts** Continue to use knowledge of addition facts and place value to derive related facts with numbers to two decimal places 0.09 plus 0.04, the total of 0.09 and 0.08, the sum of 0.06 and 0.12 , 0.04 more than 1.13 Know complements to the next whole number 4.83 + ☐ = 5 7.125 + ☐ = 8 **Mental methods and jottings** Perform mental calculations, including with mixed operations, large numbers and decimals Add positive and negative integers (in contexts such as temperature) a 6°C temperature rise from -4°C **Counting On (Sequencing):** 6.46 + 2.03 (by partitioning the second number and counting on; +2, +0.03) With Jottings: 18.7 + 5.64 (by partitioning the second number and counting on; +5, +0.3, +0.34) **Partitioning:** 3.4 + 2.77 (3+2=5, 0.4+0.7=1.1, 5+1.1+0.07=6.17) With Jottings: 27.34 + 5.78 (27+5=33, 0.3+0.7=1, 0.04+0.08=0.12, 33+1+0.12=34.12)	**Written methods** As year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency with columnar method to be secured. 657 982 + 54 976 Continue calculating with decimals, including those with different numbers of decimal places 73.82 + 17.382 **Problem Solving** Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding

Some Key Questions What do you notice? What's the same? What's different? Can you convince me? How do you know?	**Adjusting:** 6.73 + 0.99 (by adding 1 and subtracting 0.01) With Jottings: 17.4 + 5.09 (by adding 5.1 and subtracting 0.01) **Using Known Facts And Place Value:** 0.64 + 0.36 64 + 36 = 100 so 0.64 + 0.36 = 1 **Estimating:** Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. 73.82 + 17.382 is approximately 74 + 17 Continue to use appropriate strategies to check answers check 3.4 + 2.77 by adding in a different order partition or add 3 and adjust	