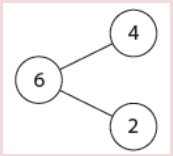
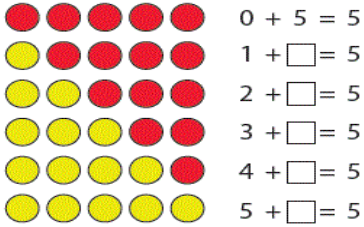
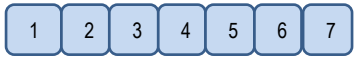
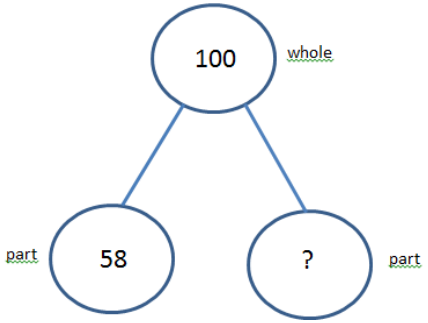
Unit Overview and Guidance

- The exemplification has been taken from the NCETM online 'Resource Toolkit', with additions in order to ensure full coverage.
- Links to the White Rose Maths hubs schemes of work (with questions categorised into the three aims of the national curriculum i.e. fluency, problem solving and reasoning) are hyperlinked to each of the objectives. Many thanks go to the White Rose Maths hub for permission to include their resources.
- The NCETM reasoning questions have also been incorporated into each unit and are identified in pale purple boxes underneath the group of the most relevant objectives.
- The 'big Ideas' sections from the NCETM 'Teaching for Mastery' documents have been included at the start of each unit. Hyperlinks to the full NCETM 'Teaching for Mastery' documents have also been included for easy reference.
- Hyperlinks to NRich activities have also been added to this version. These are found by clicking on the blue buttons like this one 1 at the bottom of relevant objective.
- Some additional content has been added in order to support mixed-aged planning. Any additional content is in *italics*. Occasionally ~~strikethrough~~ has been used to identify when an objective has been altered and this is primarily where an objective has been split between two units.
- Each unit is sub-divided into sections for ease of planning. Sub-categories in this unit are;
    1. Addition and Subtraction
    2. Solve Problems
    3. Checking

	Reception	Yr1	Yr 2	Yr 3
NCETM Teaching for Mastery Questions, tasks and activities to support assessment	**The Big Ideas** *Number (Early Learning Goals)* Using quantities and objects, they add and subtract 2 single-digit numbers and count on or back to find the answer.	**The Big Ideas** Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5 and adding the 2 to 8 to make 10 and then the 5 to total 15. Thinking of part whole relationships is helpful in linking addition and subtraction. For example, where the whole is 6, and 4 and 2 are parts. This means that 4 and 2 together form the whole, which is 6 and 6 subtract 4 leaves the 2 and 6 subtract 2 leaves the 4. 	**The Big Ideas** Understanding that addition of two or more numbers can be done in any order is important to support children's fluency. When adding two numbers it can be more efficient to put the larger number first. For example, given 3 + 8 it is easier to calculate 8 + 3. When adding three or more numbers it is helpful to look for pairs of numbers that are easy to add. For example, given 5 + 8 + 2 it is easier to add 8 + 2 first than to begin with 5 + 8. Understanding the importance of the equals sign meaning 'equivalent to' (i.e. that 6 + 4 = 10, 10 = 6 + 4 and 5 + 5 = 6 + 4 are all valid uses of the equals sign) is crucial for later work in algebra. Empty box problems can support the development of this key idea. Correct use of the equals sign should be reinforced at all times. Altering where the equals sign is placed develops fluency and flexibility.	**The Big Ideas** Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5, and adding the 2 and 8 to make 10, then the 5 to 15. This should then be applied when calculating with larger numbers. Subtraction bonds can be thought of in terms of addition: for example, in answering 15 – 8, thinking what needs to be added to 8 to make 15. Counting on for subtraction is a useful strategy that can also be applied to larger numbers.
	Becoming a Mathematician	Teaching for Mastery Year 1	Teaching for Mastery Year 2	Teaching for Mastery Year 3

NUMBER: Addition and Subtraction (NAS - 7 weeks)

Strand		Reception	Yr1	Yr2	Yr3
Addition and Subtraction	Mental Recall	***40-60+ months*** *say the number that is one more than a given number*	**represent and use number bonds and related subtraction facts within 20** **Within 10: Part whole model** **Within 10: Fact families – Addition facts** **Within 10: Find number bonds within 10** **Within 10: Systematic number bonds** **Within 10: Number bonds to 10** **Within 10: Compare number bonds** **Within 10: Fact families – The 8 facts** **Within 20: Find and make number bonds** **Within 20: Related facts** Use the pattern to complete the number sentences. Now do the same for rows of 6 counters, 7 counters, 8 counters, 9 counters and 10 counters  0 + 5 = 5 1 + □ = 5 2 + □ = 5 3 + □ = 5 4 + □ = 5 5 + □ = 5 Recall all number bonds to and witihin 10. Exposing the structure of the mathematics supports this process. They should then apply this to number bonds to 20, so if 5 + 3 = 8, 15 + 3 = 18 • I'm thinking of a number. I've subtracted 6 and the answer is 8. What number was I thinking of? Explain how you know. • I'm thinking of a number. I've added 7 and the answer is 18. What number was I thinking of? Explain how you know. • I know that 6 and 4 is 10. How can I find 7 + 4? How could you work it out?  1 2 3 4 5 6 7	**recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100** **Within 20: Fact families** **Within 20: Compare number sentences** **Related facts** **Bonds to 100 (tens)** **Bonds to 100 (tens and ones)** Extend their knowledge and use of number facts, and use partitioning and number bonds to add and subtract numbers mentally to answer questions such as 60 – □ = 52 or 35 = 20 + □. They make jottings where appropriate to support their thinking. Answer problems such as: Look at this number sentence: □ + □ = 20. What could the two missing numbers be? What else? Can you tell me all the pairs of numbers that make 20?	***(Year 2 adapted) Begin to know addition and subtraction facts to 100*** *How much more than 65 is100?* *What is the difference between 32 and 100?* *How many fewer is 58 than 100?* *Answer problems such as:* *Look at this number sentence: □ + □ = 100. What could the two missing numbers be? What else?* *58 + □ = 70 + 30* 

NUMBER: Addition and Subtraction (NAS - 7 weeks)

	Equivalence	***30-50 months*** *Compares two groups of objects, saying when they have the same number.* ***30-50 months*** *Separates a group of three or four objects in different ways, beginning to recognise that the total is still the same* ***Adult Initiated*** **Explore equivalence with balancing scales**: place a number of counters or cubes in to clear plastic bags. Ask children to count and label the bags. *What do you think will happen when we put one bag on each side of the scale? Why do you think that will happen? Does everyone agree?* *Why is the 8 bag lower than the 5 bag? What could we do to make the scales balance? How many should we add to this bag? Why do you think that will work? Could we take some away?*	**read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs** **Within 10: Addition symbol** **Within 10: How many left? (2) (Introducing the subtraction symbol)** **Within 10: Comparing statements (1)** **Within 10: Comparing statements (2)** **Within 20: Compare number sentences** • Use the vocabulary add, subtract, minus, equals, is the same value as, total, more than, fewer/less than. • Explain that things on both sides of the equals sign have the same value • Know that the 'total' can be presented on either side of the equals sign • Complete 'empty box' number sentence 1 2 3	**show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot** Understand that addition can be done in any order and use this to solve an addition by rearranging the numbers to simplify the operation. They need to understand that two numbers can be taken away from each other but that the answers will not be the same. 1 2 3	

NUMBER: Addition and Subtraction (NAS - 7 weeks)

Addition and Subtraction

Mental and Written Calculations

30-50 months *Shows an interest in number problems.*
30-50 months *Shows curiosity about numbers by offering comments or asking questions*
40-60+ months *find the total number of items in two groups by counting all of them*
40-60+ months *find one more or one less from a group of up to five objects, then ten objects*
40-60+ months *in practical activities and discussion, begin to use the vocabulary involved in adding and subtracting*

Adult Initiated

Find the total by counting all: *There are 2 cars in the garage. Let's count them.3 more arrive. Let's count them. How many cars now?(Count: 1, 2… 1, 2, 3… 1, 2, 3, 4, 5)*

Use the part-whole model to support understanding of moving the two parts together to find the whole/ total

There are three cookies on one plate and two on another, how any cookies are there altogether?

Say how many there are altogether by counting on.

- *Count 5 pebbles into a cloth bucket. How many pebbles are in the bucket?*
- *Count 2 more pebbles into the bucket. How many pebbles are in the bucket now?*
- Hop three spaces on the number track. Now hop two more. *What number did you start on? Where are you now?*
- *Let's count on 2 from 3:4,5. So 3 add 2 is 5*
- Count 4 beans into a tin with a lid on. Emphasise that there are 4 beans in the tin.
- Label the lid with 4. Put 3 more beans on the table.
- *How many beans are there altogether?* (Count on 3 from the hidden 4: 5, 6, 7) *So 4 add 3 is 7.*

add and subtract one-digit and two-digit numbers to 20, including zero

Within 10: Adding together

Within 10: Adding more

Within 10: Finding a part

Within 10: how many left (1)?

Within 10: Subtraction - breaking apart

Within 10: Counting back

Within 10: Finding the difference

Within 20: Add by counting on

Within 20: Add by making 10

Within 20: Subtraction – not crossing 10

Within 20: Subtraction – crossing 10 (1)

Within 20: Subtraction – crossing 10 (2)

- What is 37 subtract 10? How did you work that out? How could you show that using cubes/a number line/a 100-square? What would 37 subtract 20 be?
- Make up some difference questions with the answer 5. Can you show how to solve them using counters? Can you show how to find the answer on a number line?

1 2

add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

Add and subtract ones

10 more and 10 less

Add and subtract 10s

Add a 2-digit and 1-digit number – crossing ten

Subtract a 1-digit number from a 2-digit number – crossing ten

Add two 2-digit numbers – not crossing ten – add ones and add tens

Add two 2-digit numbers – crossing ten – add ones and add tens

Subtract a 2-digit number from a 2-digit number – not crossing ten

Subtract a 2-digit number from a 2-digit number – crossing ten – subtract ones and tens

Adding three one-digit numbers

Use partitioning, counting strategies and knowledge of number bonds to add or subtract a one-digit number or a multiple of 10 to any two-digit number. To work out 86 – 50, for example, they might partition and calculate:

86 – 50 = 80 + 6 – 50 = 80 – 50 + 6 = 30 + 6 = 36

Similarly, to find the total number of people on a bus with 14 people on the top deck and 8 below, they might use:

14 + 8 = 14 + 6 + 2 = 20 + 2 = 22

Children add or subtract two-digit numbers using practical and informal methods and their knowledge of the relationships between operations. For example, they count back along a number line to find 64 – 25 or count up from 67 to find the answer to 94 – 67. They represent such calculations as number sentences. They calculate the value of an unknown in a number sentence such as

☐ ÷ 2 = 6 or 85 – ☐ = 29.

They recognise, for example, that to answer 85 – ☐ = 29 they could use the related addition 29 + ☐ = 85

1 2 3 4 5

add and subtract numbers mentally, including a three-digit number and ones, a three-digit number and tens, three-digit number and hundreds

Add and subtract multiples of 100

Add and subtract three-digit number and ones – not crossing 10

Subtract a 1-digit number from a 3-digit number – crossing 10

Add a 3-digit number and tens – crossing 100

Subtract tens from a 3-digit number – crossing 100

Add and subtract 100s

What number is 27 more than 145? What number is 19 more than 145? Explain how you worked out these two calculations.

Work out the missing digits:

3☐ + ☐2 = 85

Work out these subtraction calculations:

72 – 5	372 – 68	270 – 3
82 – 15	132 – 28	70 – 66

Did you use the same method for each calculation? If not, why not? Explain your methods to a friend and compare your methods with theirs.

What number is 199 more than 428?

What is the difference between 1999 and 4003?

NUMBER: Addition and Subtraction (NAS - 7 weeks)

Addition and Subtraction	Mental and Written Calculations	***Adult Initiated (continued)*** **Say how many are left when some are taken away, by counting back** from the number. *We made 6 cookies. We ate 2 of them. How many cookies are left?* (Count back 2 from 6: 5, 4. Say together: 6 take away 2 is 4.) ***Enabling Environments –child initiated, adult supported*** **Outdoors** **Role play:** car parking at the garage- 2 cars already parked. 3 more **Construction:** make a boat with seats out of large blocks/planks crates. 3 passengers get on. At the next port 2 more are waiting to get aboard (count on). *How many passengers are left when 1 leaves the boat?* (count back) Collecting bricks in the trolley/ wheelbarrow etc. Count 6 bricks into the wheelbarrow and then 2 more. *How many bricks are in your load now?* **Indoors** **Small world:** adding more play people to the house, castle, etc., adding more or taking them away dinosaurs from the ' swamp' *How many are there now?* **Malleable area:** rolling out 4 'buns' and putting them on a tray. Rolling out 3 more and putting them on another tray/same tray? *How many have we now*? (counting on) Counting back activities from the 'buns/cakes' left. Adding candles to a birthday cake. **Cooking:** Counting spoonful's when baking 1			**add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction** **Add 3-digit and 1-digit – crossing 10** **Add and subtract 3-digit numbers and tens – not crossing 100** **Spot the pattern – making it explicit** **Add and subtract a 2-digit and 3-digit number – not crossing 10 or 100** **Add a 2-digit and 3-digit number – crossing 10 or 100** **Subtract a 2-digit number from a 3-digit number – cross the 10 or 100** **Add two 3-digit numbers – not crossing 10 or 100** **Add two 3-digit numbers – crossing 10 or 100** **Subtract a 3-digit number from a 3-digit number – no exchange** **Subtract a 3-digit number from a 3-digit number – exchange** Would you use a mental, written or calculator method to solve each of these? Explain your choice. 23.05 + ☐ = 176.25 What is the total cost if I buy food costing £3.86 and £8.57? These are the start and finish times of a film. START 14:05 FINISH 16:25 How long was the film? A packet of crisps costs 32p. Josh buys two packets. How much change does he get from £1?

NUMBER: Addition and Subtraction (NAS - 7 weeks)

Addition and Subtraction	NCETM Reasoning		**Convince me** In my head I have two odd numbers with a difference of 2. What could they be? Convince me **Missing numbers** Fill in the missing numbers (using a range of practical resources to support) 12 + □ = 19 20 - □ = 3 **Fact families** Which four number sentences link these numbers? 12, 15, 3 **What else do you know?** If you know; 12 – 9 = 3 what other facts do you know? **Missing symbols** Write the missing symbols (+ - =) in these number sentences: 17 □ 3 □ 20 18 □ 20 □ 2 **Working backwards** Through practical games on number tracks and lines ask questions such as "where have you landed?" and "what numbers would you need to throw to land on other given numbers?" **What do you notice?** 11 – 1 = 10 11 – 10 = 1 Can you make up some other number sentences like this involving 3 different numbers? **Continue the pattern** 10 + 8 = 18 11 + 7 = 18 Can you make up a similar pattern for the number 17? How would this pattern look if it included subtraction? **Missing numbers** 9 + □ = 10 10 - □ = 9 What number goes in the missing box?	**Convince me** What digits could go in the boxes? Try to find all of the possible answers. How do you know you have got them all? Convince me 7 □ - 2 □ = 46 **Fact families** Which four number sentences link these numbers? 100, 67, 33 **What else do you know?** If you know; 87 = 100 – 13 what other facts do you know? **Missing symbols** Write the missing symbols (+ - =) in these number sentences: 80 □ 20 □ 100 100 □ 70 □ 30 87 □ 13 □ 100 **True or false?** Are these number sentences true or false? Give your reasons. 73 + 40 = 113 98 – 18 = 70 46 + 77 = 123 92 – 67 = 35 **Hard and easy questions** Which questions are easy / hard? Explain why you think the hard questions are hard? 23 + 10 = 93 + 10 = 54 + 9 = 54 + 1 = **Other possibilities** □ + □ + □ = 14 What single digit numbers could go in the boxes? How many different ways can you do this? **Continue the pattern** 90 = 100 – 10 80 = 100 – 20 Can you make up a similar pattern starting with the numbers 74, 26 and 100? **Missing numbers** What number goes in the missing box? 91 + □ = 100 100 - □ = 89	**True or false?** Are these number sentences true or false? 597 + 7 = 614 804 – 70 = 744 768 + 140 = 908 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 323 + 10 = 393 + 10 = 454 - 100 = 954 - 120 = Explain why you think the hard questions are hard? **Convince me** □□ □□ □□ The total is 201 Each missing digit is either a 9 or a 1. Write in the missing digits. Is there only one way of doing this or lots of ways? Convince me **Possibilities** I bought a book which cost between £9 and £10 and I paid with a ten pound note. My change was between 50p and £1 and was all in silver coins. What price could I have paid?

NUMBER: Addition and Subtraction (NAS - 7 weeks)

Solving Problems	Solving Problems	***40-60+ months*** *record using marks that they can interpret and explain* ***40-60+ months*** *begin to identify own mathematical problems based on own interests and fascinations*	**solve one-step problems involving addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9** • Make up some additions with the answer 15. Try to put them in different ways, like this: 10 + 5 = 15. The total of 10 and 5 is 15. 10 and 5 more makes 15. • How many ways can you show me that 9 subtract 3 is 6? • Make up some subtractions with the answer 5. Try to put them in different ways, like this: 11 – 6 = 5. The difference between 6 and 11 is 5. 1	**solve problems with addition and subtraction:** • **using concrete objects and pictorial representations, including those involving numbers, quantities and measures** • **applying their increasing knowledge of mental and written methods** 1 2 3 4 5 6 7 8 9	**solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction** • Layla has 45p in her money bank and 28p in her purse. How much more money does she need to buy a comic that costs £1? • Ben and Jess are answering this problem: • Mary has collected 61 key rings, Jo has 45. How many more key rings does Mary have than Jo? • Ben does the calculation 61 + 45. Jess does the calculation 61 – 45. Who is correct? Explain how you know. • I pay for a coach trip costing £7.80 with a £10 note. How much change should I get? • A film starts at 6:30 pm and ends at 8:10 pm. How many minutes does the film last? • Josh buys one coconut and half a kilogram of bananas. What does he pay? Coconut 78p Bananas £1.50 per kg Show your working. Explain your method to a friend. • Holly has these coins. She wants to buy a notebook costing £1.50. How much more money does she need? • I travel on a journey lasting 1 hour 25 minutes. The train leaves the station at 7:45 am. What time does the train arrive?

NUMBER: Addition and Subtraction (NAS - 7 weeks)

Checking	Estimating, inverses & rounding			**recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems** **Check calculations** Check their addition and subtraction with a calculation that uses the inverse operation. Answer questions, such as: Look at this number sentence: 74 – 13 = 61 Write three more number sentences using these numbers. How do you know, without calculating, that they are correct? What addition facts can you use to help you calculate these? 12 – 5, 19 – 8 Explain how the addition facts helped you. I think of a number, I subtract 19 and the answer is 30. What is my number? How do you know? 1 2 3 4 5	**estimate the answer to a calculation and use inverse operations to check answers** **Estimate answers** **Check answers** Paul says 172 – 15 = 163. Write down an addition calculation that you could do to check this. Paul's working is: 170 – 10 = 160 and 5 – 2 = 3 so 172 – 15 = 163 Can you identify where Paul has gone wrong?
	NCETM Reasoning		**Making an estimate** Pick (from a selection of number sentences) the ones where the answer is 8 or 9. **Is it true that?** Is it true that 3+4 = 4 + 3?	**Making an estimate** Which of these number sentences have the answer that is between 50 and 60 74 - 13 55 + 17 87 – 34 **Always, sometimes, never** Is it always, sometimes or never true that if you add three numbers less than 10 the answer will be an odd number	**Making an estimate** Which of these number sentences have the answer that is between 50 and 60 174 - 119; 333 – 276; 932 - 871 **Always, sometimes, never** Is it always, sometimes or never true that if you subtract a multiple of 10 from any number the units digit of that number stays the same? Is it always, sometimes or never true that when you add two numbers together you will get an even number?