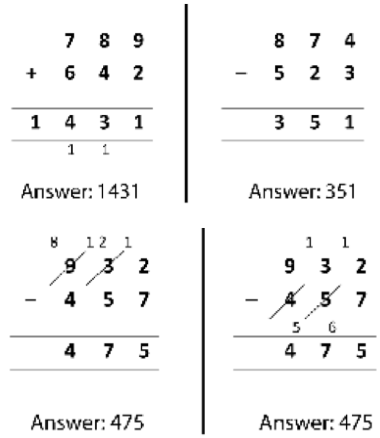
Unit Overview and Guidance

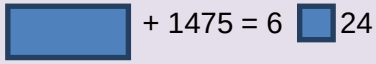
- The exemplification has been taken from the NCETM online 'Resource Toolkit', with additions in order to ensure full coverage.
- Links to the White Rose Maths hubs schemes of work (with questions categorised into the three aims of the national curriculum i.e. fluency, problem solving and reasoning) 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

	Yr 3	Yr 4	Yr 5	Yr 6
NCETM Teaching for Mastery Questions, tasks and activities to support assessment	**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.	**The Big Ideas** It helps to round numbers before carrying out a calculation to get a sense of the size of the answer. For example, 4786 – 2135 is close to 5000 – 2000, so the answer will be around 3000. Looking at the numbers in a calculation and their relationship to each other can help make calculating easier. For example, 3012 – 2996. Noticing that the numbers are close to each other might mean this is more easily calculated by thinking about subtraction as difference.	**The Big Ideas** Before starting any calculation is it helpful to think about whether or not you are confident that you can do it mentally. For example, 3689 + 4998 may be done mentally, but 3689 + 4756 may require paper and pencil. Carrying out an equivalent calculation might be easier than carrying out the given calculation. For example 3682 – 2996 is equivalent to 3686 – 3000 (constant difference).	**The Big Ideas** Deciding which calculation method to use is supported by being able to take apart and combine numbers in many ways. For example, calculating 8·78 + 5·26 might involve calculating 8·75 + 5·25 and then adjusting the answer. The associative rule helps when adding three or more numbers: 367 + 275 + 525 is probably best thought of as 367 + (275 + 525) rather than (367 + 275) + 525.
	Teaching for Mastery Year 3	Teaching for Mastery Year 4	Teaching for Mastery Year 5	Teaching for Mastery Year 6

NUMBER: Addition and Subtraction (NAS - 4 weeks)

Strand		Yr3	Yr4	Yr5	Yr6
Addition and Subtraction	Mental Calculations	**add and subtract numbers mentally, including a three-digit number and ones, a three-digit number and tens, three-digit number and hundreds** 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?	***(Y3 extended) add and subtract numbers mentally, including a three-digit number and ones, a three-digit number and tens, three-digit number and hundreds*** *What is 27 more than 185?* *What is 19 less than 208?* *3 ☐ 5 + ☐ 48 = 473* *What's the difference between 2996 and 5008?*	**add and subtract numbers mentally with increasingly large numbers** Respond rapidly to oral or written questions, explaining the strategy used, e.g. 750 take away 255, take 400 from 1360, 4500 minus 1050, subtract 3250 from 7600, 1800 less than 3300, 4000 less than 11 580 Derive quickly related facts, e.g. 80 + 50 = 130, 130 – 50 = 80, 800 + 500 = 1300, 1300 – 800 = 500 Derive quickly number pairs that total 100 or pairs of multiples of 50 that total 1000, e.g. 32 + 68 = 100 or 150 + 850 = 1000 Identify and use near doubles, e.g. work out 28 + 26 = 54 by doubling 30 and subtracting first 2, then 4, or by doubling 26 and adding 2 Add or subtract the nearest multiple of 10, 100 or 1000 and adjust, e.g. adding or subtracting 9, 19, 29 ... to/from any two-digit number Work out mentally by counting up from a smaller to a larger number e.g. 8000 – 2785 is 5 + 10 + 200 + 5000 = 5215 Understand and use language associated with addition and subtraction, e.g. difference, sum, total	**perform mental calculations, including with mixed operations and large numbers** e.g.230 – 96 + 92 – 15 
	Written Calculations	**add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction** 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?	**add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate**  	**add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)** Use standard written methods for addition and subtraction, e.g. calculate 14 136 + 3258 + 487 or 23 185 – 2078 Use written methods to find missing numbers in addition and subtraction calculations, e.g. 6432 + □ = 8025 Use written methods to add and subtract numbers with different numbers of digits, e.g. Find all the different totals that can be made using any three of these five numbers: 14 721, 76, 9534, 788, 6	***(Y5 extended) add and subtract ~~whole~~ numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)*** *Use standard written methods for addition and subtraction,* *e.g. calculate 15.98 + 26.314 and 125.48 – 72.3* *Use written methods to find missing numbers in addition and subtraction calculations,* *e.g. 6.34 + □ = 10.345* *Use written methods to add and subtract numbers with different numbers of digits, and different numbers of decimal places* *e.g. Find all the different totals that can be made using any three of these five numbers: 14 311, 76, 0.546, 96.78, 780, 7.1*

NUMBER: Addition and Subtraction (NAS - 4 weeks)

Addition and Subtraction	NCETM Reasoning	**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?	**True or false?** Are these number sentences true or false? 6.7 + 0.4 = 6.11 8.1 – 0.9 = 7.2 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 13323 - 70 = 12893 + 300 = 19354 - 500 = 19954 + 100 = Explain why you think the hard questions are hard? **Convince me**  What is the largest possible number that will go in the rectangular box? What is the smallest? Convince me **Possibilities** Adult tickets cost £8 and Children's tickets cost £4. How many adult and children's tickets could I buy for £100 exactly? Can you find more than one way of doing this?	**True or false?** Are these number sentences true or false? 6.17 + 0.4 = 6.57 8.12 – 0.9 = 8.3 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 213323 - 70 = 512893 + 300 = 819354 - 500 = 319954 + 100 = Explain why you think the hard questions are hard? **Convince me**  What numbers go in the boxes? What different answers are there? Convince me	**True or false?** Are these number sentences true or false? 6.32 + = 8  Give your reasons. **Hard and easy questions** Which questions are easy / hard? 213323 - 70 = 512893 + 37 = 8193.54 - 5.9 = Explain why you think the hard questions are hard? **Missing symbols** Write the missing signs (+ - x ÷) in this number sentence: **What else do you know?** If you know this: 86.7 + 13.3 = 100 what other facts do you know? **Convince me** Three four digit numbers total 12435. What could they be? Convince me

NUMBER: Addition and Subtraction (NAS - 4 weeks)

Solving Problems

Solving Problems

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

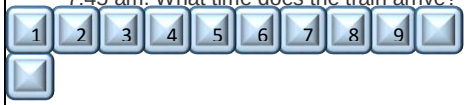
Show your working. Explain your method to a friend.

- 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?



solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Children should be able to carry out practical tasks such as to run the class market stall.

- I have read 134 of the 512 pages of my book. How many more pages must I read to reach the middle?
- There are 8 shelves of books. 6 of the shelves hold 25 books each. 2 of the shelves have 35 books each. How many books altogether are on the shelves?
- I think of a number, subtract 17, and divide by 6. The answer is 20. What was my number?
- You start to read a book on Thursday. On Friday you read 10 more pages than on Thursday. You reach page 60. How many pages did you read on Thursday?

A shop sells sunglasses

What is the difference between the cheapest and most expensive?

Ryan buys sunglasses at £4.69 and a sun hat

He pays with £10 note.

How much change will he get?

solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why *including understanding of the equals sign*

Choose the appropriate operations to solve multi-step problems, decide whether the calculations can be done mentally or using a written method and explain and record how the problem was solved using numbers, signs and symbols.

- 13 502 people were at the match last week and there are 2483 more this week, how many more people need to attend to bring the total to the club's target of 20 000 people?

Identify and obtain the necessary information to solve the problem and determine if there is any important information missing,

Calculate total cost of a holiday for a family, given prices for adults and children and surcharges for particular resorts.

Use written methods to solve problems and puzzles such as:

275	382	81	174
206	117	414	262
483	173	239	138
331	230	325	170

Choose any four numbers from the grid and add them.

Find as many ways as possible of making 1000.

Place the digits 0 to 9 to make this calculation correct:

□□□□ – □□□ = □□□

Two numbers have a total of 1000 and a difference of 246. What are the two numbers?

solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Two numbers have a difference of 1.583

One of the numbers is 4.728.

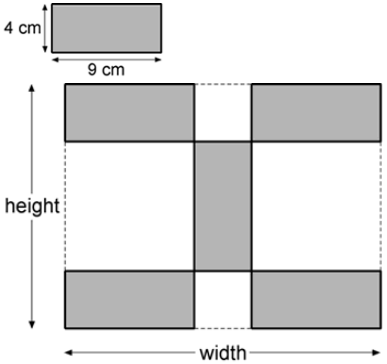
What is the other number? Is this the only answer?

solve problems involving addition and subtraction, multiplication and division

Identify subtractions they can do without writing anything down

Identify why it is possible to solve a calculation mentally, explain the clues they looked for and then solve it

- Peter has £10. He buys 3 kg of potatoes at 87p per kg and 750 g of tomatoes at £1.32 per kg. How much money does he have left?
- Each tile is 4 centimetres by 9 centimetres.



Calculate the width and height of the design.

Write down the calculations that you did.

NUMBER: Addition and Subtraction (NAS - 4 weeks)

<table>
<tr><td rowspan="2">Checking</td><td>Estimating, inverses & rounding</td><td><u>estimate the answer to a calculation and use inverse operations to check answers</u>

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?</td><td><u>estimate and use inverse operations to check answers to a calculation</u>

Tina has read the first 85 pages in a book that is 150 pages long. Which number sentence could Tina use to find the number of pages she must read to finish the book?

A 150 + 85 = ☐
B ☐ – 85 = 150
C 150 +85 = ☐
D 150 – 85 = ☐</td><td><u>use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy</u>

Use rounding to approximate and check e.g.

2593 + 6278 must be more than 2500 + 6200

2403 – 1998 is about 2400 – 2000

Write approximate answers to calculations, e.g. write an approximate answer for 516 ÷ (15 + 36)</td><td><u>use estimation to check answers to calculations and determine, in the context of a problem, to an appropriate degree of accuracy</u>

Children should be able to:

Give the best approximation to work out 178.45 + 34.6 + 85.2 and explain why. Answer questions such as: roughly, what answer do you expect to get? How did you arrive at that estimate? Do you expect your answer to be greater or less than your estimate? Why?</td></tr>
<tr><td>NCETM Reasoning</td><td>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?</td><td>Making an estimate

Which of these number sentences have the answer that is between 550 and 600

1174 - 611

3330 – 2779

9326 - 8777

Always, sometimes, never

Is it always sometimes or never true that the difference between two odd numbers is odd?</td><td>Making an estimate

Which of these number sentences have the answer that is between 0.5 and 0.6?

11.74 - 11.18

33.3 – 32.71

Always, sometimes, never

Is it always, sometimes or never true that the sum of four even numbers is divisible by 4?</td><td>Making an estimate

Circle the number that is the best estimate to

932.6 - 931.05

1.3 1.5 1.7 1.9

Always, sometimes, never

Is it always, sometimes or never true that the sum of two consecutive triangular numbers is a square number?</td></tr>
</table>