HIAS MOODLE+ RESOURCE

HIAS Progression in Calculation

Addition and Subtraction

Hampshire Maths Team
April 2024
Final version

Overview

This document gives a suggested guidance as to how calculation strategies may be taught in all year groups showing clear progression from Year 1 to Year 6.

Points to consider when using this resource:
Teachers should use this resource flexibly to meet the needs of individual pupils. Teachers should be familiar with previous year groups and ensure that children are secure with concepts and strategies before moving on. Reference has been made to the National Curriculum when developing this resource and the progression within the Big Ideas provided by the NCETM. This resource works alongside Hampshire Schemes of Learning Unit plans but can also complement a blocked curriculum approach. Manipulatives and visual representations should be used alongside the more formal recording of a strategy to ensure pupils develop both a conceptual and procedural understanding of a mathematical concept. This document focuses upon progression in the formal calculation strategies. Further details of multi-representations to support conceptual understanding/ mental fluency are detailed in the unit plans referred to within this document.

Addition – Year 1

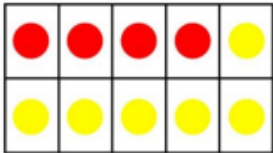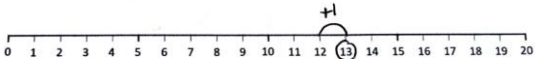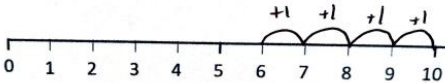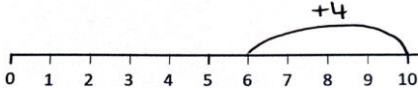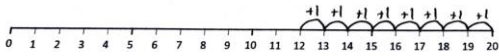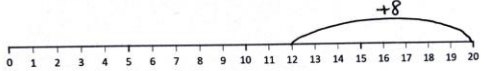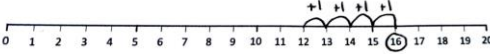| Selected National Curriculum Programme of Study Statements	The Big Ideas (NCTEM)
Pupils should be taught to: • represent and use number bonds and related subtraction facts within 20. • add and subtract 1-digit and 2-digit numbers to 20, including 0.	Relating numbers to 5 and 10 helps develop knowledge 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.

Stage 1	Stage 2	End of Year Expectation
Represent number bonds within 10. 4 + 6 = 10 'Contains material developed by NCETM and licensed under Open Government Licence v3.0' http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ Find 1 more from any given number within 20. 12 + 1 = 13	Use number bonds within 10. 6 + 4 = 10 6 + 4 = 10 Find 1 more from any given number within 50. 	Represent and use number bonds within 20. 12 + 8 = 20 12 + 8 = 20 Find 1 more from any given number within 100. Add 1-digit and 2-digit numbers to 20. 12 + 4 = 16

Linked to Hampshire Scheme of Learning Units 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.9 and 1.12.
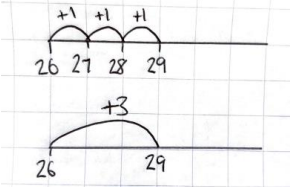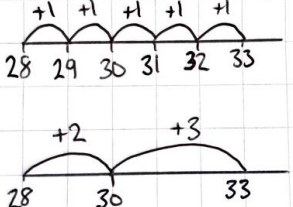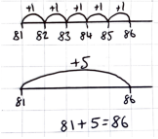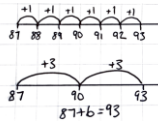
Addition – Year 2

Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)

Pupils should be taught to:
• recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100.
• add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
   o a 2-digit number and ones
   o a 2-digit number and tens
   o two 2-digit numbers
   o adding three 1-digit numbers
	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.

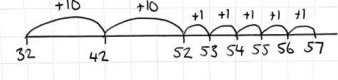| Stage 1	Stage 2	End of Year Expectation
Add 2-digit numbers and ones to 50 without bridging. Add 2-digit numbers and ones to 50 with bridging. 	Add 2-digit numbers and ones to 100 without bridging. Add 2-digit numbers and ones to 100 with bridging. Add 2-digit and tens. Adding three 1-digit numbers. 	Adding two 2-digit numbers without bridging. Adding two 2-digit numbers with bridging.

Addition – Year 3

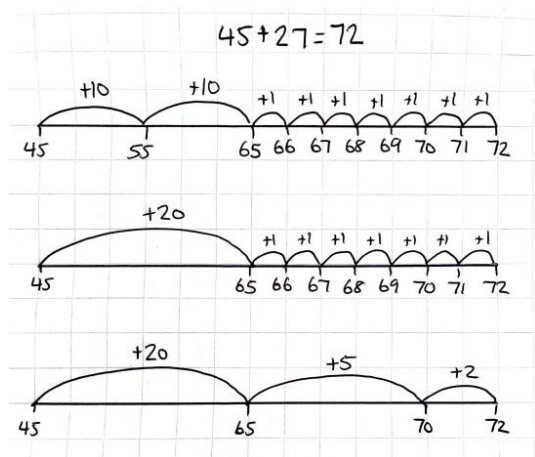| Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)

Pupils should be taught to:
• add and subtract numbers mentally, including:
   ○ a 3-digit number and ones
   ○ a 3-digit number and tens
   ○ a 3-digit number and hundreds
• add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
	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

Stage 1	Stage 2	End of Year Expectation
Adding two 2-digit numbers with bridging.	Adding a 3-digit number and ones.	Introduce column addition with numbers up to 3-digits.

Stage 1

Adding two 2-digit numbers with bridging.

$45 + 27 = 72$

Stage 2

Adding a 3-digit number and ones.

$234 + 1 = 235$ $234 + 4 = 238$

Adding 3-digit and tens.

$422 + 10 = 432$ $422 + 30 = 452$

Adding a 3-digit number and tens crossing the hundreds boundary.

$284 + 30 = 314$

Adding a 3-digit number and hundreds.

$247 + 300 = 547$
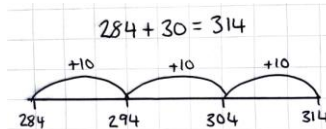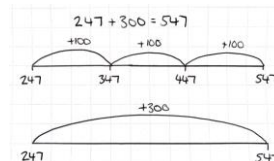
End of Year Expectation

Introduce column addition with numbers up to 3-digits.

Ensure number sentences chosen would not be more suited to a more efficient mental strategy.

Begin with expanded.

$$\begin{array}{r} 700 + 80 + 9 \\ 600 + 40 + 2 \\ \hline 1300 + 120 + 11 = 1431 \end{array}$$

Then progress to compact.

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \end{array}$$

Addition – Year 4

Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)
Pupils should be taught to: • add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate • solve addition and subtraction two-step problems in context, deciding which operations and methods to use and why • count backwards through zero to include negative numbers (subtraction only)	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.

Stage 1	Stage 2	End of Year Expectation
Column addition with numbers up to 3-digits. *Ensure number sentences chosen would not be more suited to an efficient strategy.*	Column addition with numbers up to 4-digits. *Ensure number sentences chosen would not be more suited to an efficient strategy.*	Multistep problem in context involving addition. *(Provide a mixture of opportunities to apply mental and formal strategies taught)*

Stage 1 working:

$$\begin{array}{r} 7\ 8\ 9 \\ +\ 6\ 4\ 2 \\ \hline 1\ 4\ 3\ 1 \end{array}$$

Stage 2 working:

$$\begin{array}{r} 3\ 9\ 8\ 2 \\ +\ 1\ 7\ 6\ 6 \\ \hline 5\ 7\ 4\ 8 \end{array}$$

End of Year Expectation:

Some children vote for their favourite ice-cream flavour.

Ice-cream flavour	Number of children
vanilla	87
chocolate	154
strawberry	?
mint	38
Total	**402**

How many children vote for **strawberry**?

$$\begin{array}{r} 1\ 5\ 4 \\ +\ \ \ 8\ 7 \\ \hline 2\ 4\ 1 \end{array} \qquad \begin{array}{r} 2\ 4\ 1 \\ +\ \ \ 3\ 8 \\ \hline 2\ 7\ 9 \end{array}$$

$$\begin{array}{r} ^3 4\ ^9 {\not{8}}\ ^1 2 \\ -\ 2\ 7\ 9 \\ \hline 1\ 2\ 3 \end{array} \qquad \text{Strawberry} = 123$$

Linked to Hampshire Scheme of Learning Units 4.1, 4.2, 4.7, 4.10 and 4.13.

Addition – Year 5

Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)
Pupils should be taught to: • add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction) • solve problems involving numbers up to three decimal places. • Interpret negative numbers in context, count forwards and backwards with positive and negative numbers through zero.	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).

Stage 1	Stage 2	End of Year Expectation
Column addition with numbers up to 4-digits. *Ensure number sentences chosen would not be more suited to an efficient strategy.* Adding involving numbers up to 1 and 2 decimal places. 	Column addition with numbers with more than 4-digits. *Ensure number sentences chosen would not be more suited to an efficient strategy.* Adding involving numbers up to 2 decimal places. Adding with negative numbers (linking with temperature). 	Multistep problem in context, deciding which methods to use and why. *(Provide a mixture of opportunities to apply mental and formal strategies taught)* Contains materials developed by the Standards and Testing Agency for 2016 national curriculum assessments and licensed under Open Government Licence v3.0 'http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ Adding involving numbers up to 3 decimal places.

Addition – Year 6

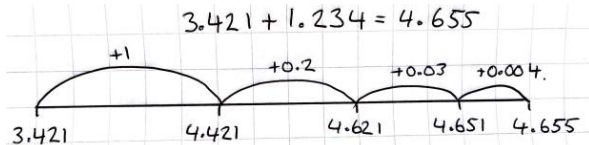| Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)
Pupils should be taught to: • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy • use negative numbers in context, and calculate intervals across zero	Deciding which calculation method to use is supported by being able to take apart and combine numbers in many ways. For example, calculating $8 \cdot 78 + 5 \cdot 26$ might involve calculating $8 \cdot 75 + 5 \cdot 25$ 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 $(367 + 275) + 525$.

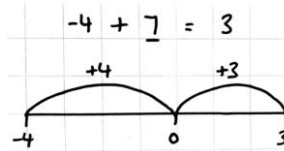| Stage 1	Stage 2	End of Year Expectation
Column addition with numbers with more than 4-digits. *Ensure number sentences chosen would not be more suited to an efficient strategy.* Adding involving numbers up to 3 decimal places.	Adding negative numbers in context. Here are the temperatures in four cities at midnight and at midday. At **midnight**, how many degrees colder was Paris than Rome?	Multistep problem in context, deciding which methods to use and why. *(Provide a mixture of opportunities to apply mental and formal strategies taught)* At the start of June, there were 1,793 toy cars in the shop. During June, • 8,728 more toy cars were delivered • 9,473 toy cars were sold. How many toy cars were left in the shop at the end of June?

Subtraction – Year 1

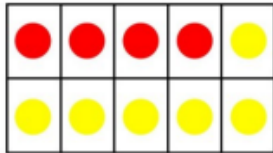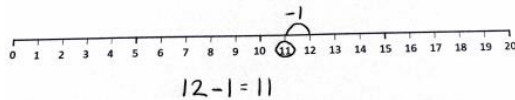| Selected National Curriculum Programme of Study Statements	The Big Ideas (NCTEM)
Pupils should be taught to: • represent and use number bonds and related subtraction facts within 20 • add and subtract 1-digit and 2-digit numbers to 20, including 0	Relating numbers to 5 and 10 helps develop knowledge 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.

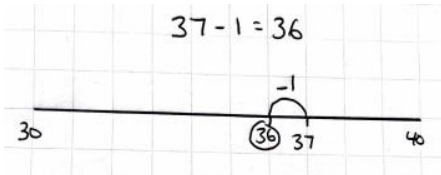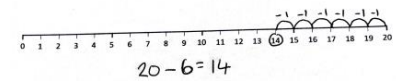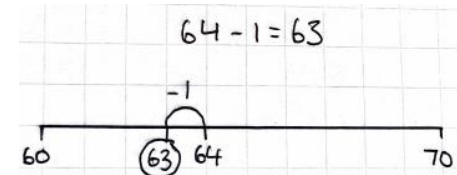| Stage 1	Stage 2	End of Year Expectation
Represent number bonds within 10. $10 - 6 = 4$ 'Contains material developed by NCETM and licensed under Open Government Licence v3.0' http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ Find 1 less from any given number within 20. 	Use number bonds within 10. Find 1 less from any given number within 50. 	Represent and use number bonds within 20. Find 1 less from any given number within 100. Subtract 1-digit and 2-digit numbers within 20.
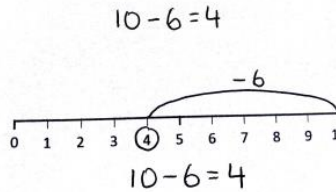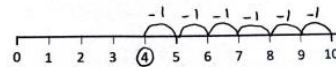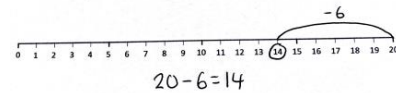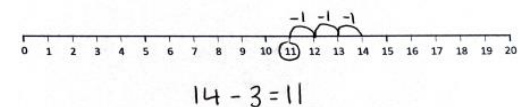
Linked to Hampshire Scheme of Learning Units 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.9 and 1.12.

Subtraction – Year 2

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Selected National Curriculum Programme of Study Statements
Pupils should be taught to:

recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

a 2-digit number and ones
a 2-digit number and tens
two 2-digit numbers
adding three 1-digit numbers

show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot

</td>
<td>
The Big Ideas (NCETM)
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.
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</table>

Stage 1	Stage 2	End of Year Expectation
Subtract 2-digit numbers and ones with numbers to 50 without bridging.	Subtract 2-digit numbers and ones to 100 without bridging.	Subtract two 2-digit numbers without bridging.
Subtract 2-digit numbers and ones to 50 with bridging.	Subtract 2-digit numbers and ones to 100 with bridging.	Subtract two 2-digit numbers with bridging.
	Subtract 2-digit numbers and tens.	

Subtraction – Year 3

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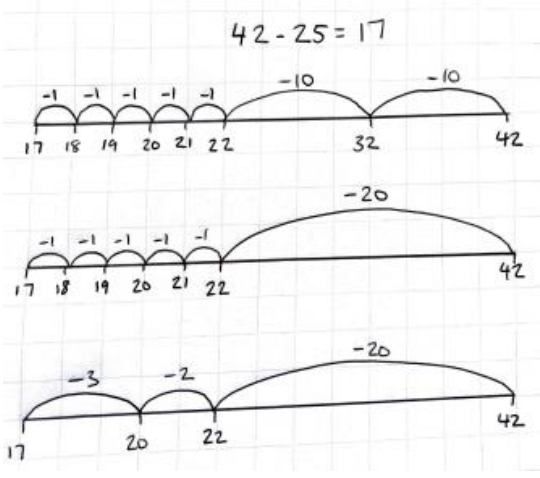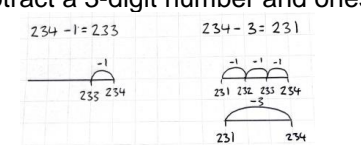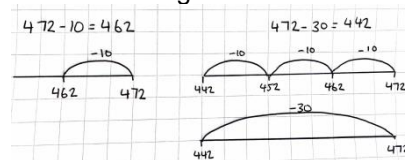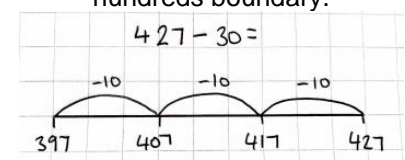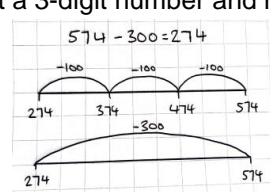**Selected National Curriculum Programme of Study Statements**

Pupils should be taught to:
- add and subtract numbers mentally, including:
  - a 3-digit number and ones
  - a 3-digit number and tens
  - a 3-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
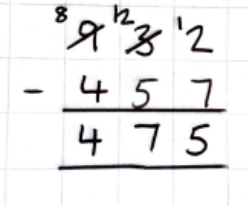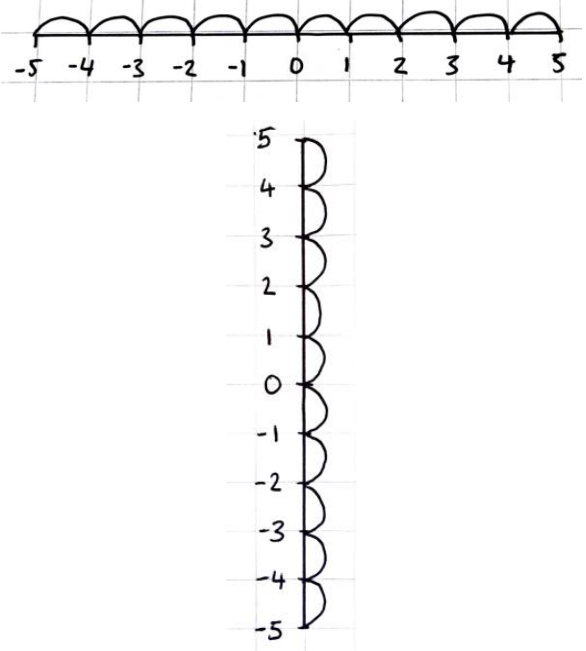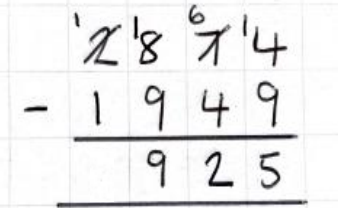
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The Big Ideas (NCETM)

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

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<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>End of Year Expectation</th>
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<td>

Subtract two 2-digit numbers with bridging.

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Subtract a 3-digit number and ones.

Subtract a 3-digit number and tens.

Subtract a 3-digit number and tens crossing the hundreds boundary.

Subtract a 3-digit number and hundreds.

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<td>

Introduce column subtraction with numbers up to 3-digits.

Ensure number sentences chosen would not be more suited to a more efficient mental strategy.

Begin with expanded (without carrying).

Progress to compact (without carrying then with carrying).

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</table>

Subtraction – Year 4

Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)
Pupils should be taught to: • add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate • solve addition and subtraction two-step problems in context, deciding which operations and methods to use and why • count backwards through zero to include negative numbers (subtraction only)	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.

Stage 1	Stage 2	End of Year Expectation
Column subtraction up to 3-digits. *Ensure number sentences chosen would not be more suited to a more efficient mental strategy.*	Count backwards through zero (linking with temperature).	Column subtraction with numbers up to 4-digits. *Ensure number sentences chosen would not be more suited to a more efficient mental strategy.*

Linked to Hampshire Scheme of Learning Units 4.1, 4.2, 4.7, 4.10 and 4.13.

Subtraction – Year 5

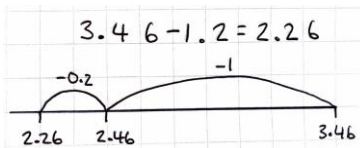| Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)
Pupils should be taught to: • add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction) • solve problems involving numbers up to three decimal places • Interpret negative numbers in context, count forwards and backwards with positive and negative numbers through zero.	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).

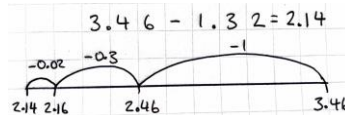| Stage 1	Stage 2	End of Year Expectation
Column subtraction with numbers up to 4-digits. *Ensure number sentences chosen would not be more suited to a more efficient mental strategy.* Subtracting involving numbers up to 1 and 2 decimal places. 	Column subtraction with numbers up to 5-digits. *Ensure number sentences chosen would not be more suited to a more efficient mental strategy.* Subtracting involving numbers up to 2 decimal places. Subtract with negative numbers (linking with temperature). 	Multistep problem in context, deciding which methods to use and why. *(Provide a mixture of opportunity to apply mental and formal strategies taught)* This table shows the number of people living in various towns in England. What is the **difference** between the numbers of people living in Bedford and in Dover? Contains materials developed by the Standards and Testing Agency for 2016 national curriculum assessments and licensed under Open Government Licence v3.0 'http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ Subtracting involving numbers up to 3 decimal places.
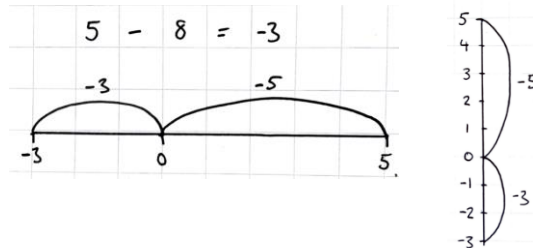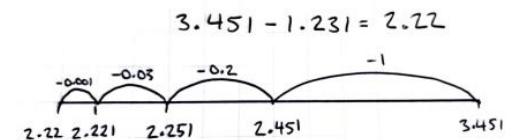
Linked to Hampshire Scheme of Learning Units 5.1, 5.7, 5.10, 5.14, 5.15 and 5,18.

Subtraction – Year 6

Selected National Curriculum Programme of Study Statements	The Big Ideas (NCETM)
Pupils should be taught to: • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy • use negative numbers in context, and calculate intervals across zero	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.

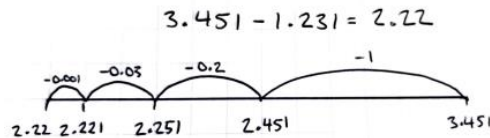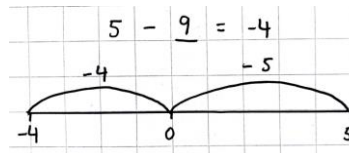| Stage 1	Stage 2	End of Year Expectation
Column subtraction with number with more than 4-digits. *Ensure number sentences chosen would not be more suited to a more efficient mental strategy.* Subtracting involving numbers up to 3 decimal places. 	Subtracting with negative numbers in context. This table shows the temperature at 9 am on three days in January. |	1st January	8th January	15th January
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	+5°C	−4°C	+1°C | What is the difference between the temperature on 1st January and the temperature on 8th January? [ ] °C 	Multistep problem in context, deciding which methods to use and why. *(Provide a mixture of opportunity to apply mental and formal strategies taught)* One Saturday afternoon, a total of 234,869 people attended three rugby matches. • 80,978 people attended match 1 • 72,319 people attended match 2 How many people attended match 3?

Linked to Hampshire Scheme of Learning Units 6.1, 6.7, 6,10 and 6.15.

HIAS Maths Team

Jo Lees – Lead Inspector
Email: jo.lees@hants.gov.uk

Kate Spencer – Lead Inspector
Email: kathryn.spencer@hants.gov.uk

Rebecca Vickers – Teaching & Learning Advisor
Email: rebecca.vickers@hants.gov.uk

Nikki Barber – Teaching & Learning Advisor
Email –Nicola.Barber@hants.gov.uk

Olivia Goodburn – Teaching & Learning Advisor
Email – Olivia.Goodburn@hants.gov.uk

For further details on the full range of services available please contact us using the following email:

htlcdev@hants.gov.uk

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