Unit 4A1 2 weeks

Counting, partitioning and calculating

Objectives
End-of-year expectations (key objectives) are highlighted
• Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols
• Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1)
• Recognise and continue number sequences formed by counting on or back in steps of constant size
• Use knowledge of addition and subtraction facts and place value to derive sums and differences of pairs of multiples of 10, 100 or 1000
• Add or subtract mentally pairs of two-digit whole numbers (e.g. 47 + 58, 91 – 35)
• Derive and recall multiplication facts up to 10 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple
• Multiply and divide numbers to 1000 by 10 and then 100 (whole-number answers), understanding the effect; relate to scaling up or down
• Identify the doubles of two-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves
• Use a calculator to carry out one-step and two-step calculations involving all four operations; recognise negative numbers in the display, correct mistaken entries and interpret the display correctly in the context of money
• Use knowledge of rounding, number operations and inverses to estimate and check calculations

Starters

1	**Place value in three-digit numbers**	Revisit

Objective: Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1)

Remind children how to read and write three-digit whole numbers in figures and words. Remind them also of the value of each digit in numbers such as 465, 509, 930. Get them to partition some three-digit numbers, writing them in expanded form, for example:

462 = 400 + 60 + 2

Write some three-digit starter numbers on the board, such as 143, 185, 504, 309.

Start with 143. Ask the class to count back in tens to 3. Ask children, if they were to count back in tens from the other starter numbers, how close they would get to 0. Check for 185.

- Tell me some other three-digit starting numbers that will get closer to zero. Explain why.

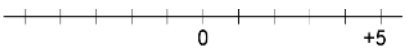
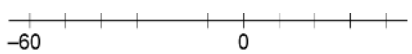
Now count back in hundreds, starting with numbers such as 567, 903, 850. Ask:

- Which number will get closest to zero when we count back in hundreds? Why?
- What is 100 more than 567? 100 less than 903? 10 less than 903?
- Is 567 nearer to 500 or 600? How do you know?
- What is 567 rounded to the nearest 100? To the nearest 10? Explain why.

2	**Counting in fives using positive and negative numbers** Revisit **Objective:** Recognise and continue number sequences formed by counting on or back in steps of constant size **Objective:** Use positive and negative numbers in context and position them on a number line Count together in fives from 3 to 63. • How would you describe this sequence? (start with 3, then keep adding 5) • What do you notice about the units digits of the numbers in the sequence? (all 3 or 8) • Will 87 be in the sequence if it continues? How do you know? • What would be the next number in the sequence after 98? How did you work it out? • What would be the number in the sequence before 203? How did you work it out? Together count back in fives from 63 to 3. • How would you describe this sequence? (start with 63, then keep subtracting 5) • What will be the next number in the sequence after 3? (–2) • How will the sequence continue after that? (–7, –12, –17, –22, …) • What do you notice about the units digits of the negative numbers in the sequence? (all 2 or 7)
3	**Doubling and halving** Rehearse **Objective:** Identify the doubles of two-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves Practise doubling and halving some numbers up to 20: double 9, double 17, halve 26, halve 38. Ask children to explain their strategies for, say, doubling 17. Remind them that doubling is the same as multiplying by 2 and halving is the same as dividing by 2. • What do you think the answer to double 40 will be? Why? Establish that double 40 is the same as double 4 multiplied by 10, so the answer is 80. Write on the board: $2 \times 40 = 2 \times (4 \times 10) = (2 \times 4) \times 10$ Now ask for: double 80, double 140, double 110. Get children to explain their answers.

Main activities

1	**Place value in four-digit numbers** **Objective:** Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1) Give out copies of Resource 4A1.1. Display one as an OHT. Ask questions such as: • What do you notice about the numbers? • Are the numbers arranged in a special way? • What patterns can you see? Point to 9000, 400, 60, 5 on the chart. Get children to read them aloud – nine thousand, four hundred, sixty, five. With place value cards, make the number 9465 and get children to read the number aloud. Use the cards to check that children can partition the number and say what each digit represents. Record on the board: 9465 = 9000 + 400 + 60 + 5

	Show the class how to write the number: nine thousand four hundred and sixty-five. Repeat using other numbers from the grid. Write some four-digit numbers on the board. Tell children that they are to write each four-digit number in their books, partition it and then write the number in words. Work through an example. Explain that when they have finished they should read their numbers to their partner. Review children's work and correct any misinterpretations. Shuffle a set of 0–9 digit cards. Get a child to pick four cards and make a four-digit number. Record the number on the board. With the class read the number aloud. Repeat until four numbers have been generated. • How do you decide which number is the largest? How do you decide which is the smallest? With the class put the numbers in order. Stress how to compare the thousands digits, then the hundreds digits and so on. Choose any two of the numbers. Write the numbers with a greater than (>) or less than (<) sign between them, for example 4193 > 3127 and 3127 < 4193. Read the two number sentences aloud together. Repeat with another two of the numbers. **Review** Write randomly on the board the digits 1, 7, 3, 5. Ask children to take these digits from their 0–9 packs and to make the largest possible number. Now ask them to make the smallest possible number. • Can you make a number between 2500 and 3500? (3157 or 3175) • Can you make a number between 7250 and 7500? (7315 or 7351)
2	**Positive and negative numbers in context** Revisit **Objective:** Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1) Use an OHP calculator. Start at 5. Count down in ones to below zero, asking children to predict the next number before you press the equals sign. Explain that negative numbers are referred to as 'negative one', 'negative two' and so on. Draw on the board a number line with ten intervals. Mark 0 in the centre of the line, and +5 at the right-hand end.  Point to different positions on the line. Ask children to say what the numbers should be. When the numbers are written in, count backwards together from +5 to –5 and back to +5. Erase the numbers, mark in –60 at the left-hand end and 0 at the sixth division.  Point to different positions on the line, asking the class: • What number is this? Label the numbers as they are identified. Ask some questions such as: • Tell me a number that is less than –20. Tell me a number that is more than –30. Tell me a number that lies between –20 and 10. Record answers on the board, for example:

	–40 < –20 –10 > –30 –20 < 0 < 10 Show children an OHT made from Resource 4A1.2. Say that the thermometers measure temperature in degrees Celsius, and point out the °C abbreviation on them. Discuss the scales on the thermometers, explaining that they usually show only some numbers, leaving the others unmarked. Identify the positive and negative numbers on the scale. Ask children: • What is the temperature in York? In Rome? Show how to record these temperatures as 2 °C and 7 °C. Stress that as the temperature measurement moves down the scale and passes zero, the temperature is falling and the air is getting colder. Point out where –5 °C lies on each scale. Invite a child to indicate where –7 °C lies. Explain that, with temperatures, this is read as 'minus seven degrees Celsius' not 'negative seven degrees Celsius' and that it means that the temperature is seven degrees Celsius below zero. Ask a few questions for children to answer on their whiteboards: remind them that they should always include the units when they write a temperature. • The temperature starts at 4 °C and goes down by 10 degrees. What is the temperature now? How did you work it out? • What will it be when it has risen by 3 degrees? Now ask the class to complete the questions on the OHT. **Review** Use the ITP 'Thermometer'. Discuss the scale on the thermometer. Identify zero and the value of the intervals on the scale. Point to a value and ask children to write it on their whiteboards. Repeat for different values. • What will this temperature be after a rise of 3 degrees? After a fall of 4 degrees? Demonstrate using the thermometer to confirm children's answers.
3	**Doubling and halving** **Objective:** Identify the doubles of two-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves Write on the board a selection of whole numbers between 20 and 50: 21 24 28 32 35 38 43 46 Ask children if they can double any of the numbers straight away (e.g. 21, 32). Cross out these numbers and record on the board, for example, 21 × 2 = 42, 32 × 2 = 64. Ask children to use their books and to work in pairs to double the remaining numbers. Allow a couple of minutes, then go through the numbers one by one, inviting children to the board to explain their method to the class. Look for these methods: • using known facts, for example 19 × 2 is 2 less than double 20; • splitting the number into tens and ones or units, for example 28 × 2 is double 20 + double 8; • splitting the number in other ways, for example 38 × 2 is double 35 plus double 3. Use a diagram to show children how they can always double a two-digit number by doubling the tens and doubling the ones or units.

47

40 + 7

↓ ↓ × 2

80 + 14 = 94

Ask children to use this method to double 28, then 36, doing as much as possible mentally.

Show the class how the method can be extended to doubling a sum of money such as £27.38 by splitting the pounds and the pence.

£27 38p

£20 + £7 + 30p + 8p

↓ ↓ ↓ ↓ × 2

£40 + £14 + 60p + 16p

£54 76p = £54.76

Give one or two examples to practise, such as £13.09 and £36.75.

Repeat the above for halving numbers, starting with some simple practice of halving numbers to 20, including odd numbers (e.g. half of 15 is $7\frac{1}{2}$).

- What do you think the answer to half of 120 will be? Why?

Establish that half of 120 is the same as half of 12 multiplied by 10, so the answer is 60. Write on the board:

half of 120 = half of (12 × 10) = (half of 12) × 10

Now ask for: half of 80, half of 140, half of 320. Get children to explain their answers.

Practise halving a few more multiples of 10 to 200, and multiples of 100 to 2000.

Give the class some two-digit numbers under 100 to halve, inviting them to explain their strategies. Show them how they can always halve two-digit numbers by partitioning into tens and ones or units, and how to halve sums of money by partitioning into pounds and pence, using diagrams similar to those for doubling.

Give one or two examples of amounts of money to halve, such as £8.26 and £14.50.

Review

Review the work that children have done, correcting any errors or misconceptions. Choose some examples for children to demonstrate their methods on the board.

Seven more lessons consolidating the above and extending to:

a	**Deriving and using multiplication tables and multiplying numbers by 10**
b	**Deriving sums and differences of pairs of multiples of 10, 100 or 1000**
c	**Adding and subtracting mentally pairs of two-digit numbers**
d	**Solving problems using calculators and checking answers**

Unit 4A2 — 2 weeks

Counting, partitioning and calculating

Objectives
End-of-year expectations (key objectives) are highlighted
• Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols
• Recognise and continue number sequences formed by co unting on or back in steps of constant size
• Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement; position one-place and two-place decimals on a number line
• Add or subtract mentally pairs of two-digit whole numbers (e.g. 47 + 58, 91 – 35)
• Refine and use efficient written methods to add and subtract two-digit and three-digit whole numbers and £.p
• Derive and recall multiplication facts up to 10 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple
• Multiply and divide numbers to 1000 by 10 and then 100 (whole-number answers), understanding the effect; relate to scaling up or down
• Develop and use written methods to record, support and explain multiplication and division of two-digit numbers by a one-digit number, including division with remainders (e.g. 15 × 9, 98 ÷ 6)
• Use knowledge of rounding, number operations and inverses to estimate and check calculations

Starters

1	**Counting in fours or eights**	Revisit

Objective: Derive and recall multiplication facts up to 10 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple

Objective: Recognise and continue number sequences formed by counting on or back in steps of constant size

Use a counting stick.

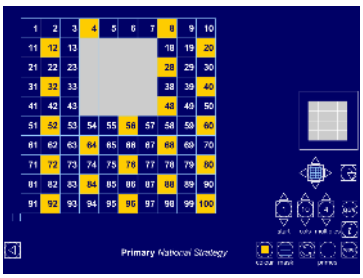
Tell children that one end is nought or zero. Count along the stick and back again in fours. Point randomly at divisions on the stick, saying:

- What is this number? How do you know?

Encourage children to use 'multiplied by' and 'divided by' in their answers. Point out that they can use the mid-point of the stick as a reference point. For example: 'I know that halfway is 4 multiplied by 5, or 20, and the next point is 4 more, or 24.'

Say that this is a good way to remember awkward facts. To remember 10 times a number is always easy. To find 5 times a number is also easy, as it is half of 10 times the number. For example, 10 times 4 is 40, so 5 times 4 is half of 40, or 20.

Repeat, this time counting in eights.

2	**Recognising multiples of 4 or 8, for example**	Recall
	Objective: Derive and recall multiplication facts up to 10 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple **Objective:** Recognise and continue number sequences formed by counting on or back in steps of constant size Use the ITP 'Number grid'. Highlight multiples of 4, for example. Ask children to discuss the patterns that they can see, and then to describe them to you. Cover part of the square with a mask and ask children to identify which multiples of 4 are hidden.  For each multiple, ask one of these questions: • How many fours are in …? • What is … divided by 4? • Tell me two division facts that you know for …? Move the mask around to different positions on the grid. Repeat with other multiples, for example multiples of 8.	
3	**Using addition and subtraction to solve grid puzzles**	Revisit and reason
	Objective: Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols Draw an incomplete 3 by 3 grid on the board or OHP. 			
164	30	
20	418	
		| Ask children to complete the grid using addition down and across. Repeat with one or two other examples. When children are confident, use this grid: |		
	70	
40		
297	562		 Point to the empty space at the top left and ask: • When I add 40 to this number, I get the answer 297. What is the number? How did you work it out? Repeat with the other empty spaces. Ask children to complete one or two more examples of the second type of grid.	

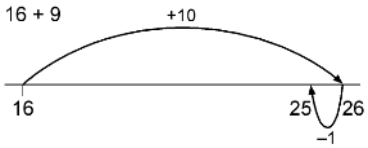
Main activities

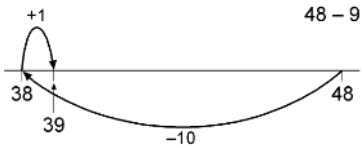
1

Adding and subtracting mentally pairs of two-digit numbers

Objective: Add or subtract mentally pairs of two-digit whole numbers (e.g. 47 + 58, 91 – 35)

Remind the class that an easy way to add or subtract 9 to or from a number is to add or subtract 10 then adjust the answer by 1. Reinforce that when adding, the answer is adjusted by subtracting 1, since an extra 1 has been added. Similarly, when subtracting, the answer is adjusted by adding 1, since 1 more than needed has been taken away. Support each explanation using an empty number line.





Ask the class to count on in nines from 75. Stop them after about ten steps, then ask them to count back in nines to 75. Discuss strategies.

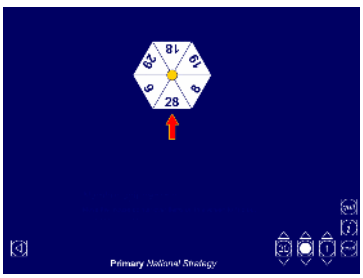
- What is an easy way to add or subtract 19 to or from a number?

Agree it is adding or subtracting 20 then adjusting by 1. Extend to adding or subtracting 29, 39, 49, … by adding or subtracting the nearest multiple of 10 and adjusting. Include crossing the 100 boundary. Ask children to use their whiteboards to answer. Encourage children to dispense with the support of the empty number line. Get them to count on or back for the multiple of 10, and then do the adjustments.

Repeat with adding or subtracting 11, 21, 31, …

- What is an easy way to add or subtract 18, 28, 58?

Establish using the nearest multiple of 10 and adjusting by 2. Provide a few practice examples as above. For example, use the ITP 'Number spinners' with a spinner labelled 8, 9, 18, 19, 28, 29.



Start with a score of 250. Spin the spinner. Ask children to subtract the number rolled from the score and to write the answer on their whiteboards. The game ends when the score becomes a one-digit number.

Relate the strategies to the context of money. Set a problem such as :

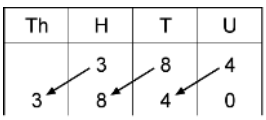
- I bought a bag of apples for 75p and a melon for 69p. How much did they cost altogether?
- How can we work this out mentally?

Take feedback and jot on the board: 75p + 70p = 145p and 145p – 1p = 144p.

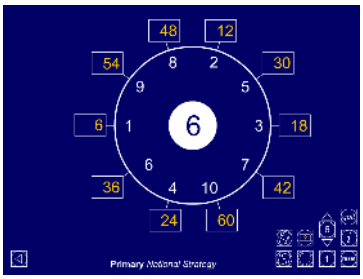
Establish that 144p is better expressed as £1.44. Repeat with a problem such as:

- Melons now cost 85p. How much more do they cost?

Give out copies of Resource 4A2.1 to pairs of children. Explain that list A and list B show the prices of items in two different shops. Children should select one price from each list.

	Working mentally, one child should find the total of the two items, while the other finds their difference. They then check each other's answers and discuss errors. On the next turn, the first child finds the difference and the second child finds the total. Repeat several times. **Review** Ask children to explain how any errors in the 'sums and differences' activity were made. Write on the board: 53 + 24. Demonstrate how to do this calculation by adding the tens first. Ask children to partition the numbers. 53 + 24 = (50 + 3) + (20 + 4) = (50 + 20) + (3 + 4) = 70 + 7 = 77 Work through other examples with the class. Demonstrate an example which crosses the tens boundary: 38 + 43 = (30 + 8) + (40 + 3) = (30 + 40) + (8 + 3) = 70 + 11 = 81
2	**Multiplying and dividing by 10 and 100** **Objective:** Multiply and divide numbers to 1000 by 10 and then 100 (whole-number answers), understanding the effect; relate to scaling up or down Ask individual children to give you a one-digit or two-digit number. Quickly respond with the number that is 10 times bigger, for example 7 → 70 and 28 → 280. Ask them to explain what you are doing to each number. Reverse the roles, with them responding to your starting numbers. Check that they understand how to multiply two-digit numbers by 10 and that they know that digits move one place to the left. Use a set of large digit cards. Ask three children to choose a card. Attach cards to the board to make a three-digit number. Discuss the value of each digit. • How can we make this number ten times bigger? Give one child a 0 card. Move each of the three-digit cards one place to the left, emphasising the movement as you do it and explaining that the value is increasing 10 times. Put the 0 card into the units or ones space, and explain that it is a place holder. Check that children understand that when the zero is removed and the digits move to the right the value is decreased by 10 times.  Repeat this with other sets of three digits to show multiplying and dividing by 10. Develop to multiplying by 100. • What happens to a number when we multiply it by 10, then by 10 again? As a class, chant the 100 times-table. Write on the board: 61 × 100 = 6100 Read the equation aloud together. Explain that each individual unit has been multiplied by 100. It has been scaled up and made 100 times larger. Demonstrate on the board, using thousands, hundreds, tens and units boxes, how each has moved two places to the left. If you wish, use the ITP 'Moving digits'. Write on the board: 28 × 100. Ask: • What do you think the answer will be? How did you work it out? Establish again that each digit has moved two places to the left. Repeat for one or two more two- or three-digit numbers. Use the OHP calculator, and multiply numbers under 100 by 100. Each time ask the class

	to predict the answer. Ask: • What will happen if I now divide the answer by 100? Establish the generalisation that dividing by 100 scales a number down and makes it 100 times smaller. Each digit has moved two places to the right. Draw out, through more examples, that dividing by 100 and multiplying by 100 are inverse operations. Give children a selection of missing-number questions to complete. For example: 42 × 100 = ☐ 280 ÷ ☐ = 28 18 × 10 = ☐ 9500 ÷ ☐ = 95 23 × ☐ = 2300 416 × ☐ = 4160 456 × ☐ = 4560 7200 ÷ ☐ = 72 **Review** Remind the class that there are 10 millimetres in 1 centimetre. To change or convert centimetres to millimetres they must multiply by 10, and to change millimetres to centimetres they must divide by 10. Ask: • How many millimetres are there in 9 centimetres? • Change 190 millimetres into centimetres. To change metres to centimetres they must multiply by 100, and to change centimetres to metres they must divide by 100. Ask: • A table is 2 metres long. How many centimetres is that? • Change 900 centimetres into metres.
3	**Deriving and learning to recall multiplication and division facts** **Objective:** Derive and recall multiplication facts up to 10 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple Write on the board the 2 times-table. Write the 4 times-table next to it. • What relationship can you see between these two tables? Draw out that multiplying by 2 doubles a number, and multiplying by 4 doubles it again. Demonstrate that 15 × 4 = 15 × 2 × 2 = 30 × 2 = 60. Demonstrate other examples, such as 23 × 4, 31 × 4. • Does the rule of doubling and doubling again apply to every number you multiply by 4? Give children a few minutes to discuss this with a partner. Write on the board 15 × 8. • How could we calculate this? Draw out that one strategy is to double, double and double again. Ask children to choose five 2-digit numbers, and to multiply each of them by 4. Use a counting stick and count along it and back again in multiples of 3. Then chant the 3 times-table forwards and backwards: 'one three is three, two threes are six, three threes are nine, …'. Show children how they can use doubling to work out the 6 times-table from the 3 times-table. Ask questions such as: • What is 3 multiplied by 5? What is 6 multiplied by 5? • How many threes make 24? How many sixes make 24?

	Do this first with the 6 times-table on the board or OHP. Use the counting stick to practise counting along it and back again in multiples of 6. Remove or erase the 6 ti mes-table and continue the questioning. Remind children to use their knowledge of the 3 times -table and doubling strategies if they cannot remember a fact in the 6 times -table. Use the ITP 'Number dials' to develop knowledge of the division facts for the 6 times-table.  **Review** Make an OHT or prepare a table on an interactive whiteboard. 9 4 16 18 25 24 10 28 21 3 30 2 8 25 60 7 12 40 50 35 6 22 15 20 14 Ask children to suggest three numbers in the 4 times -table that they can see in the table. Using transparent counters, cover the three numbers. Choose children to say the two multiplication facts for each of the covered numbers, for example: 12 = 4 × 3 12 = 3 × 4 Now ask them to say the two division facts: 12 ÷ 4 = 3 12 ÷ 3 = 4 Remove the counters and repeat with other multiplication tables.

Seven more lessons consolidating the above and extending to:

a	**Using decimal notation for tenths and hundredths, including rounding two -digit and three-digit numbers to the nearest 10 or 100**
b	**Using efficient written methods to add and subtract two -digit and three-digit whole numbers and £.p**
c	**Multiplying and dividing a two-digit number by a one-digit number**
d	**Using rounding, number operations and inverses to estimate and check calculations**

Unit 4A3 2 weeks

Counting, partitioning and calculating

Objectives End-of-year expectations (key objectives) are highlighted
• Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate
• Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1)
• Recognise and continue number sequences formed by counting on or back in steps of constant size
• Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement; position one-place and two-place decimals on a number line
• Add or subtract mentally pairs of two-digit whole numbers (e.g. 47 + 58, 91 – 35)
• Refine and use efficient written methods to add and subtract two-digit and three-digit whole numbers and £.p
• Derive and recall multiplication facts up to 10 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple
• Develop and use written methods to record, support and explain multiplication and division of two-digit numbers by a one-digit number, including division with remainders (e.g. 15 × 9, 98 ÷ 6)
• Use a calculator to carry out one-step and two-step calculations involving all four operations; recognise negative numbers in the display, correct mistaken entries and interpret the display correctly in the context of money
• Use knowledge of rounding, number operations and inverses to estimate and check calculations

Starters

1	**Recalling multiplication and division facts**	Rehearse

Objective: Derive and recall multiplication facts up to 10 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple

As a class, recite the 8 times-table, forwards and backwards. Ask a few random questions, varying the wording.

- What is 32 divided by 8?
- What is the product of 5 and 8?
- What is the next multiple of 8 after 40?
- How many eights make 56?
- What is the remainder when 50 is divided by 8?

Discuss ways to remember awkward facts. For example, to remember 10 times a number is always easy. To find 5 times a number is also easy, as it is half of 10 times the number. For example, 10 times 8 is 80, so 5 times 8 is half of 80, or 40.

Remind children that they can always work out 8 times a number by starting with twice the number, doubling to get 4 times the number and doubling again to get 8 times the number.

2	**Counting on and back in steps of 7 or 8** Refine **Objective:** Recognise and continue number sequences formed by counting on or back in steps of constant size **Objective:** Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1) Use a counting stick. Demonstrate counting in steps of 8 starting from a two-digit number. Tell children the start number and the step (e.g. start 27, step +8). • What would the number at the end of the stick be? How do you know? Verify by counting. Establish that for a step size of +8 the number at the end of the stick will be 80 more than the start number, because there are 10 intervals. Next, start with 100. Say that this time children are to count back in steps of 8. Get them to predict the number at the end of the stick. Using an OHP calculator, enter a start number. Set the constant function to +7. Ask children to predict the numbers as you press the equals key. Repeat with –7, starting from a two-digit number such as 62. Pause at 5. • What is the next number? And the next? Explain why. Remind children of the meaning of the < and > signs. Write pairs of numbers on the board, such as –8 and 2, and –1 and –6. Ask children to write the numbers on their whiteboards with the correct sign between them.
3	**Place value in three- and four-digit numbers** Revisit and reason **Objective:** Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1) Ask children to look down or close their eyes and imagine. They should only write something when you ask them to. • Imagine the number five hundred and thirty-two drawn in the air in front of you. Which digit is in the middle? Which is on the left? Which is on the right? • Replace the middle digit with a four. What number can you see now? Write it on your whiteboard and show me. (542) • Swap over the middle digit with the one on the left. What number can you see now? (452) • Put a zero on the right. What number can you see now? Write it on your whiteboard and show me. (4520) • Remove the second digit and push the other digits together so that they are next to each other. What number can you see now? Tell your partner what you think the number is. (420)

Main activities

1	**Multiplying a two-digit number by a one-digit number or multiple of 10** **Objective:** Develop and use written methods to record, support and explain multiplication and division of two-digit numbers by a one-digit number, including division with remainders (e.g. 15 × 9, 98 ÷ 6)

Objective: Use knowledge of rounding, number operations and inverses to estimate and check calculations

- How could we multiply a number by 20?

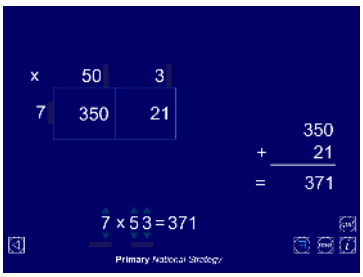
Demonstrate that 7 × 20 = 7 × 2 × 10 = 14 × 10 = 140.

- How could we multiply a number by 60?

Demonstrate that 8 × 60 = 8 × 6 × 10 = 48 × 10 = 480.

Ask children to write the answer to these questions on their whiteboards: 5 × 30, 4 × 90.

Use the ITP 'Multiplication grid'.



Select options and ask questions similar to those below.

Write 7 × 53 = 53 × 7 on the board.

- What is an estimate of the answer?

Establish that the answer will lie between:

7 × 50 = 7 × 5 × 10 = 350 and 7 × 60 = 7 × 6 × 10 = 420.

It will be closer to 350 than to 420, since 53 is closer to 50 than to 60.

Point out that 53 can be written as 50 + 3. Use a grid line like this.

×	50	3
7		

×	50	3	
7	350	21	→ 371

Work through the left-hand grid with the class to get the right-hand grid. Ask:

- How can we get the answer to 53 × 7 from the grid?

Add 350 and 21 mentally to get the answer 371.

Work through one or two more examples (e.g. 37 × 4, 72 × 6). Explain that the grid can be used as a jotting to support or explain a mental calculation.

Tell children that they may be able to do simple examples mentally without writing anything. Try 13 × 4 and 16 × 6 as mental calculations.

Review

Ask children to use their whiteboards and to answer questions such as these:

- I am thinking of a multiple 8 lying between 50 and 60. What is it?
- I am thinking of a multiple of 9 lying between 30 and 40. What is it?
- I am thinking of a multiple of 7 that is greater than 40 and less than 50. What could it be?

Invite individual children to justify their answers by asking:

- How do you know?

Expect them to answer by stating the relevant multiplication or division fact: 'I know that 56 is a multiple of 8 because 8 × 7 = 56 and 56 ÷ 8 = 7.'

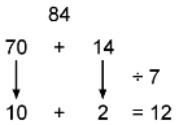
2

Dividing a two-digit by a one-digit number and rounding up or down in context

Objective: Develop and use written methods to record, support and explain multiplication and division of two-digit numbers by a one-digit number, including division with remainders (e.g. 15 × 9, 98 ÷ 6)

Objective: Use knowledge of rounding, number operations and inverses to estimate and check calculations

Remind the class how to divide a two-digit by a one-digit number. Explain that partitioning is useful in a division such as 84 ÷ 7. We partition 84 into a multiple of 70 plus the rest, and divide each part by 7.

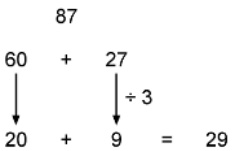


Alternatively, we could record using a grid, which links to grid multiplication.

×		
7	70	14

×	10	2	→ 12
7	70	14	

For 87 ÷ 3, we partition 87 into a multiple of 30 plus the rest, and divide each part by 3.



Ask children to use this method to divide 68 by 4 and 72 by 3.

Write on the board: 38 ÷ 6. Ask children to discuss in pairs roughly what the answer will be.

- How did you make your estimate?

Agree that 36 ÷ 6 = 6 and that 42 ÷ 6 = 7. Since 38 lies between 36 and 42, the answer to 38 ÷ 6 must lie between 6 and 7. Establish that 38 ÷ 6 = 6 R 2 and write it on the board.

Display an OHT made from Resource 4A3.1. This shows five problems. Establish that the calculation needed for each problem is the same and is 38 ÷ 6. Discuss rounding up or down for a sensible answer in the context of each question.

- Why do you need to round up for some questions and down for others?

Draw out how rounding down is appropriate when you need to know the number of full groups; and rounding up is appropriate when you need to find the number of groups including the last, incomplete group.

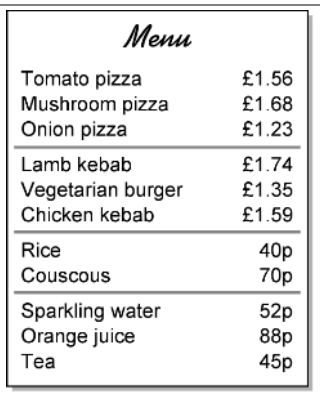
Tell children they are going to work in pairs to find sensible answers to problems. Say that the calculations needed to solve the problems are 51 ÷ 2 or 22 ÷ 9. Ask children to estimate and then calculate the answer. Hand out copies of Resource 4A3.2 and ask children to cut the questions into strips. Working in pairs, children sort the questions into four groups, first by which of the two calculations is needed and then by whether they would need to round up or down. Ask children write the answer on each strip.

Review

Focus first on the questions leading to 51 ÷ 2.

- Think of another problem using 51 ÷ 2 where you would need to round up.
- Now think of another problem where you would need to round down.

	Focus on the questions leading to 22 ÷ 9 = 2 R 4. • Which questions did you need to round up? • Which questions did you need to round down? • How did you decide? Ask children to explain their reasoning. Look at the test questions on an OHT made from Resource 4A3.3. Help children to recognise that rounding is needed to answer the second question. Discuss the calculations, estimates and solutions needed.
3	**Using a calculator to solve problems involving money** **Objective:** Use a calculator to carry out one-step and two-step calculations involving all four operations; recognise negative numbers in the display, correct mistaken entries and interpret the display correctly in the context of money **Objective:** Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate Use an OHP calculator. Point out what the different keys are called and what they do. Get children to try out some different calculations with whole numbers. Demonstrate how to clear the display and how to clear the last entry. Write on the board a money question such as £4.35 + £3.85 that children can answer easily. Ask children to key into their calculators: 4 . 3 5 + 3 . 8 5 = while you do the same on the OHP calculator. Establish that the calculator is now displaying 8.2. • What is the answer to the question? Establish that 8.2 is £8.20 in the context of the problem. Establish the correct key sequences. • How can we check that £8.20 is correct? Confirm the use of the inverse operation. Ask children to check using their calculators. • What calculation did you do to check? Confirm that either 8.2 – 4.35 or 8.2 – 3.85 could be used. • How would we enter £6.30? • How would we enter six pounds and five pence? Organise the class to work in small groups. Say that five friends are going out for a meal. The friends all have the same thing to eat. Their meal must not cost more than £20. Make up menu cards similar to the one below. Different groups of children could have different menus, depending on their ability. Give one menu card to each group.

	 Ask the groups to plan a meal for the five friends. Each friend must have at least one item from each of the four sections of the menu. Give the groups some time to work on the problem, then take feedback. • What strategies did you use to help you find a solution? Discuss different approaches to the problem. For example: – Choose, say, a vegetarian burger and work out what 5 would cost. Then choose, say, couscous and work out what 5 portions would cost, and so on. Finally, find the total. Adjust the items if the total cost is more than £20. – Work out the cost of one meal and multiply it by 5, then adjust if necessary. – Start with a division of 200 by 5 to see how much each meal can cost. Ask: • Which approach do you think is the most efficient? • How did you check your calculations? **Review** Ask different groups to describe and justify to the class their approach to the problem.

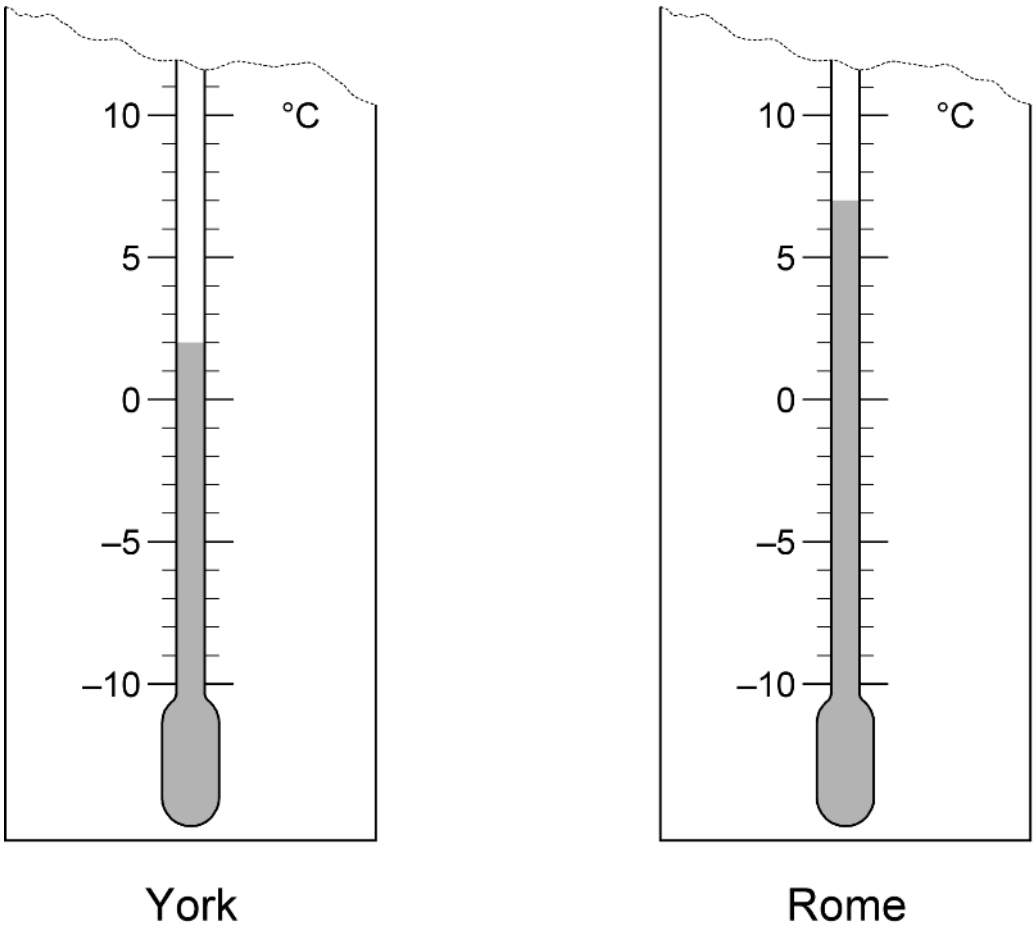
Seven more lessons consolidating the above and extending to:

a	**Securing multiplication and division facts; multiplying and dividing two -digit numbers by one-digit numbers**
b	**Decimal notation for tenths and hundredths, including partitioning and ordering decimals and adding and subtracting £.p**
c	**Adding and subtracting mentally pairs of two -digit whole numbers (e.g. 47 + 58, 91 – 35)**
d	**Solving one- and two-step problems involving money, measures or time**

Point it out grid

1000	2000	3000	4000	5000	6000	7000	8000	9000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

These are the temperatures in York and Rome on a day in winter.

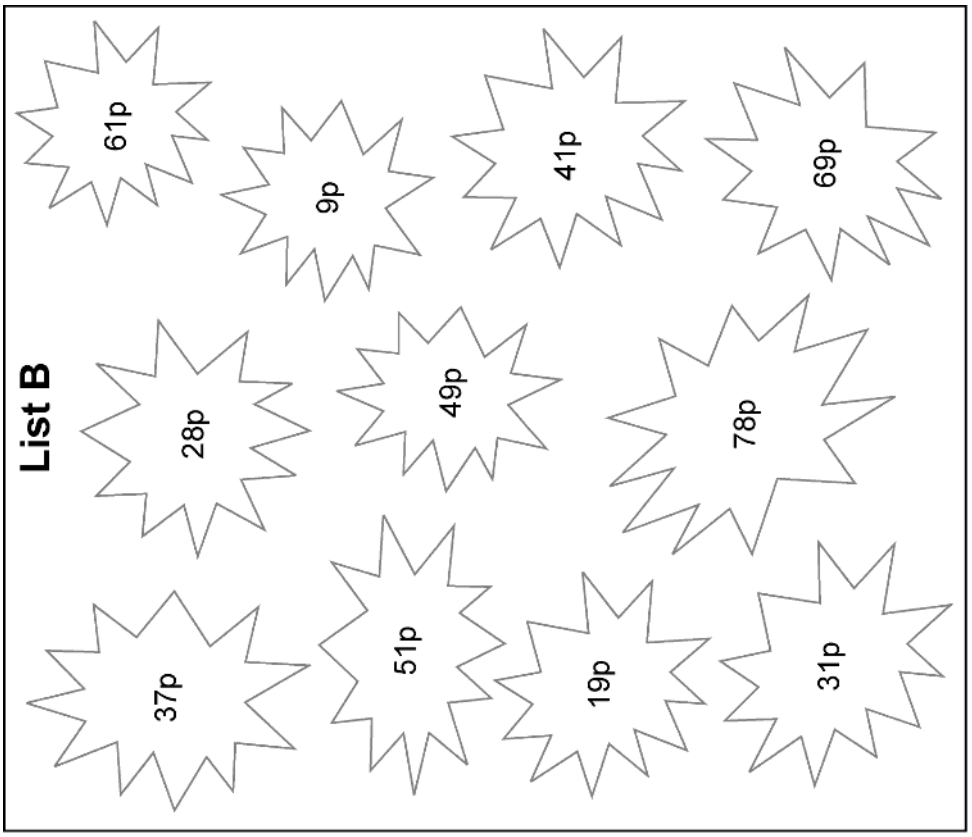


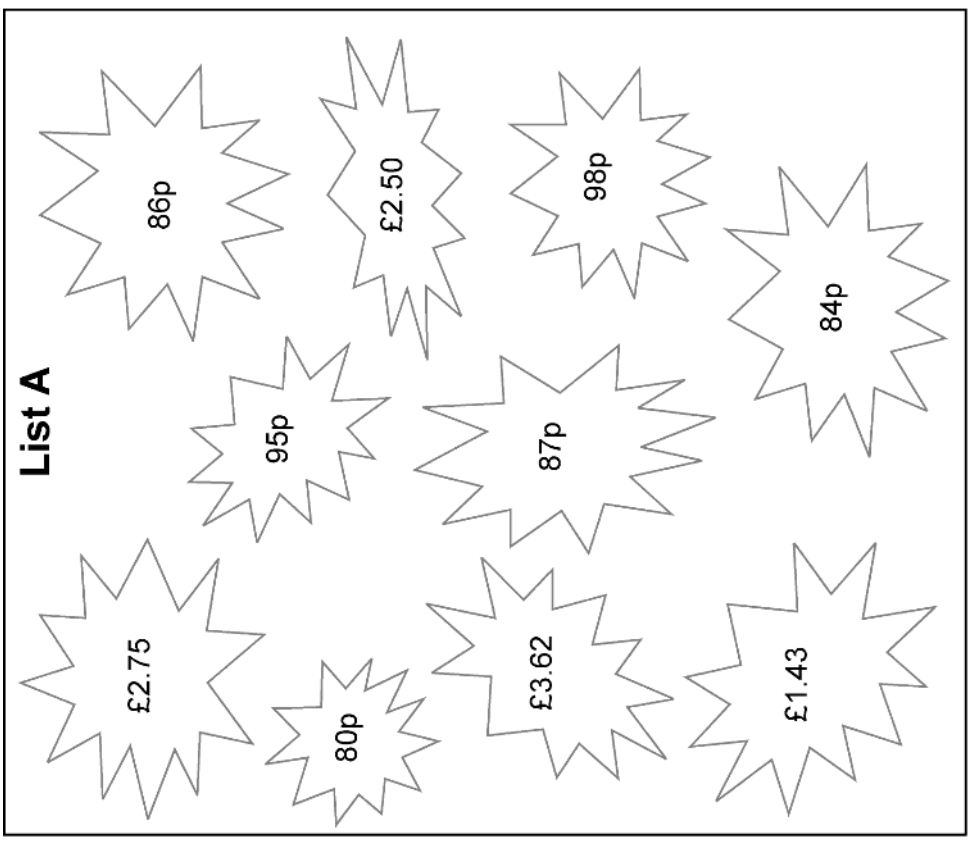
1 How many degrees colder is it in York than in Rome?

2 The temperature in York falls by 8 degrees.
What is the new temperature in York?

3 The temperature in Rome drops to –5 °C.
How many degrees did the temperature fall?

4 On another day, the temperature in York is 4 °C.
Rome is 7 degrees colder than York is.
What is the temperature in Rome?





1 I have £38.
Toys cost £6 each.
How many toys can I buy?

2 At the fair, 38 people want to ride on the Little Dipper.
A car can carry 6 people.
How many cars will the people need?

3 There are 38 children at the pantomime.
There are 6 seats in a row.
How many rows are needed to seat everyone?

4 A farmer has 38 eggs.
6 eggs will fit in a box.
How many boxes can the farmer fill?

5 A pack of DVDs cost £38.
6 friends shared the cost equally among them.
They paid with pound coins at the checkout.
How many pound coins did each of the friends pay?

1 Roy has a strip of sticking plaster 51 cm long.
He wants to cut it into 2 cm pieces for his first-aid kit.
How many 2 cm pieces can Roy cut?

2 There are 51 white socks in a drawer.
How many pairs of white socks are there?

3 Children at a party get a glass of lemonade with 2 ice cubes.
There are 51 ice cubes.
How many children can have a glass of lemonade with 2 ice cubes?

4 A pet shop has 51 hamsters. 2 hamsters can fit in a cage.
How many cages are needed for the hamsters?

5 Anna has 51 fireworks. 2 fireworks go in each box.
How many boxes can Anna fill?

6 22 people are waiting to go up in the lift.
The lift can hold 9 people.
How many times must the lift go up?

7 22 people are going to the cinema. There are 9 seats in a row.
How many rows are needed to seat everyone?

8 9 choc-bars fill a selection box. There are 22 choc-bars.
How many selection boxes can be filled?

9 Jack has 22 metres of rope.
He needs lengths of rope 9 metres long.
How many of these lengths can Jack cut?

10 Jan has £22. T-shirts cost £9 each.
How many T-shirts can Jan buy?

Some children go camping.
It costs £2.20 for each child to camp each night.
They go for 6 nights.

How much will each child have to pay for the 6 nights?

Show your **working**. You may get a mark.

£

There are 70 children.
Each tent takes up to 6 children.

What is the least number of tents they will need?

Show your **working**. You may get a mark.

tents