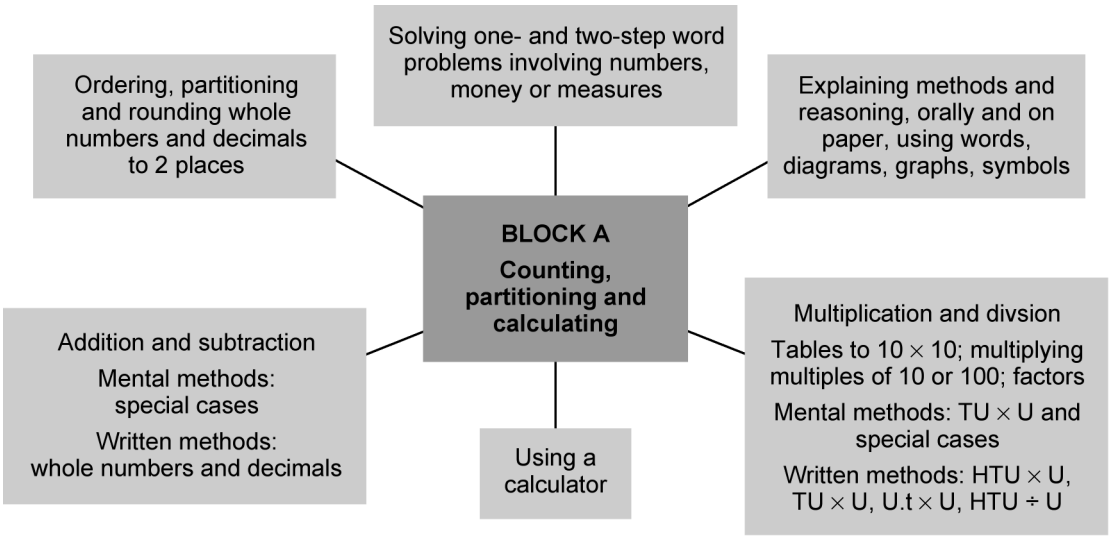
Year 5: Block A — Three 2-week units

Counting, partitioning and calculating



Objectives End-of-year expectations (key objectives) are highlighted	Units 1	 2	 3
• Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols	✓	✓	✓
• Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use		✓	✓
• Count from any given number in whole-number and decimal steps, extending beyond zero when counting backwards; relate the numbers to their position on a number line	✓	✓	✓
• Explain what each digit represents in whole numbers and decimals with up to two places, and partition, round and order these numbers	✓	✓	✓
• Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34)	✓	✓	✓
• Use efficient written methods to add and subtract whole numbers and decimals with up to two places	✓	✓	
• Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100; derive quickly corresponding division facts	✓	✓	✓
• Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9)	✓	✓	
• Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 or 1000	✓	✓	
• Extend mental methods for whole-number calculations, for example to multiply a two-digit by a one-digit number (e.g. 12 × 9), to multiply by 25 (e.g. 16 × 25), to subtract one near multiple of 1000 from another (e.g. 6070 – 4097)	✓	✓	
• Refine and use efficient written methods to multiply and divide HTU × U, TU × TU, U.t × U and HTU ÷ U			✓

Objectives	Units		
End-of-year expectations (key objectives) are highlighted	1	2	3
• Use a calculator to solve problems, including those involving decimals or fractions (e.g. to find $^{3}/_{4}$ of 150 g); interpret the display correctly in the context of measurement		✓	✓
• Use knowledge of rounding, place value, number facts and inverse operations to estimate and check calculations	✓	✓	✓

Speaking and listening objectives for the block

Objectives	Units		
	1	2	3
• Present a spoken argument, sequencing points logically, defending views with evidence and making use of persuasive language	✓		
• Analyse the use of persuasive language		✓	
• Understand the process of decision making			✓

Opportunities to apply mathematics in science

Activities		Units		
		1	2	3
5a	Keeping healthy: Use graphs from pulse rate investigations to calculate differences between pulse rates e.g. at rest, after exercise and after recovery, for individuals and between individuals in the class.	✓		
5d	Changing state: Calculate differences between times liquids take to evaporate at room temperature and in other conditions e.g. over a radiator, in the fridge, on a windy day (simulated with a hairdryer).		✓	
5e	Earth, Sun and Moon: Use a calculator to explore differences between the sizes of the Earth, Moon and Sun and the distances between them.			✓

Key aspects of learning: focus for the block

Enquiry	**Problem solving**	**Reasoning**	Creative thinking
Information processing	Evaluation	Self-awareness	Managing feeling
Social skills	**Communication**	Motivation	Empathy

Vocabulary

problem, solution, calculate, calculation, equation, operation, answer, method, explain, reasoning, reason, predict, relationship, rule, formula, pattern, sequence, term, consecutive

place value, digit, numeral, partition, decimal point, decimal place, thousands, ten thousands, hundred thousands, millions, tenths, hundredths, positive, negative, above/below zero, compare, order, ascending, descending, greater than (>), less than (<), round, estimate, approximately

add, subtract, multiply, divide, sum, total, difference, plus, minus, product, quotient, remainder, factor, multiple

calculator, display, key, enter, clear, constant

pound (£), penny/pence (p), units of measurement and their abbreviations, degree Celsius (°C)

Building on previous learning

Check that children can already:

- count from any given number in whole-number steps
- use positive and negative numbers in practical contexts; position them on a number line
- add or subtract mentally pairs of two-digit whole numbers, e.g. 47 + 58, 91 – 35
- use efficient written methods to add and subtract two- and three-digit whole numbers and £.p
- recall multiplication and division facts to 10 × 10
- multiply or divide numbers to 1000 by 10 and then 100 (whole-number answers)
- use written methods to multiply and divide TU × U, TU ÷ U
- use decimal notation for tenths and hundredths in the context of money and measurement
- order decimals to two places and position them on a number line
- use a calculator to carry out one- and two-step calculations involving all four operations; interpret the display correctly in the context of money
- use the relationship between m, cm and mm

Unit 5A1 2 weeks

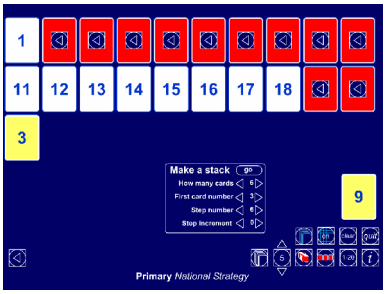
Objectives *Children's learning outcomes in italic*	Assessment for learning
• Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols *I can write down how I solved a problem, showing every step*	Tell me how you solved this problem. What does this calculation/diagram tell you? If I doubled this number, what would you have to change?
• Count from any given number in whole-number and decimal steps, extending beyond zero when counting backwards; relate the numbers to their position on a number line *I can find missing numbers in a sequence that includes negative numbers*	Create a sequence that includes the number –5. Describe your sequence to the class. Here is part of a sequence: ☐, –9, –5, –1, ☐. Explain how to find the missing numbers. Explain how you would find the missing numbers in this sequence: 10, ☐, 4, 1, ☐, –5, ☐ What is the 'rule' for the sequence?
• Explain what each digit represents in whole numbers and decimals with up to two places, and partition, round and order these numbers *I can say what any digit represents in a number with up to seven digits*	What is the value of the 7 in 3 274 105? Write in figures *forty thousand and twenty*. A number is partitioned like this: 4 000 000 + 200 000 + 60 000 + 300 + 50 + 8 Write the number. Now read it to me. What is 4773 rounded to the nearest hundred? A car costs more than £8600 but less than £9100. Tick the prices that the car could cost. £8569 ☐ £9090 ☐ £9130 ☐ £8999 ☐
• Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34) *I can work out sums and differences of decimals with two digits*	Look at these calculations with two-digit decimals. Tell me how you could work them out in your head.
• Use efficient written methods to add and subtract whole numbers and decimals with up to two places *I can explain each step when I write addition and subtraction calculations in columns*	[Point to a 'carry digit' 1.] What is the value of this 1? Why is it there? I add two numbers. One has a 3 in the thousands column, the other has a 5. The answer has 9 in the thousands column. How is this possible? Work out 3275 – 1837, explaining every step that you write.
• Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100; derive quickly corresponding division facts *I know my tables to 10. I can use them to work out division facts and to multiply multiples of 10 and 100*	If someone had forgotten the 8 times-table, what tips would you give them to help them to work it out? What links between multiplication tables are useful? How many nines are there in 63? Divide 80 by 4. Write in the missing numbers. 5 × 70 = ☐ 600 × 4 = ☐ 4 × ☐ = 200 What is 50 times 90?

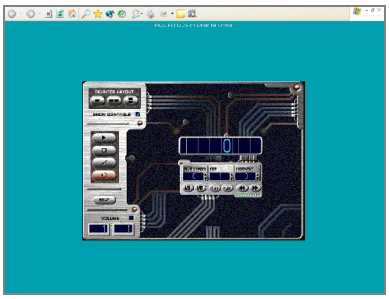
Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9) *I can find a pair of factors for a two-digit number*	Here are four number cards. 3 12 7 4 Which two number cards are factors of 42? Put a ring around the numbers which are factors of 30. 4 5 6 20 60 90 How can you use factors to multiply 15 by 12?
• Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 or 1000 *I can multiply or divide a whole number by 10, 100 or 1000*	This calculator display shows 0.1. Tell me what will happen when I multiply by 100. What will the display show? What number is ten times as big as 0.01? How do you know that it is ten times 0.01? I divide a number by 10, and then again by 10. The answer is 0.3. What number did I start with? How do you know? How would you explain to someone how to multiply a decimal by 10? What is a quick way to multiply by 1000? To divide by 100? How many hundreds are there in one thousand? Divide 9300 by 100.
• Extend mental methods for whole-number calculations, for example to multiply a two-digit by a one-digit number (e.g. 12 × 9), to multiply by 25 (e.g. 16 × 25), to subtract one near-multiple of 1000 from another (e.g. 6070 – 4097) *I can work out some calculations in my head or with jottings. I can explain how I found the answer*	Which of these subtractions can you do without writing anything down? Why is it possible to solve this one mentally? What clues did you look for? What is the answer to the one that can be solved mentally? How did you find the difference? Talk me through your method. [If the child explains a method of counting backwards, ask:] Is it possible to count up as well? Why will this give the same result? Which is easier? If 2003 is the answer to a similar question, what could the question be?
• Use knowledge of rounding, place value, number facts and inverse operations to estimate and check calculations *I can estimate and check the result of a calculation*	Roughly, what will the answer to this calculation be? How do you know that this calculation is probably right? Could you check it a different way?
• Present a spoken argument, sequencing points logically, defending views with evidence and making use of persuasive language *I can describe each stage of my calculation method (e.g. for 18 × 25). I can explain why it is a good method for this calculation*	These cards describe the steps in adding £4.65, 98p and £3.07. Arrange the cards in order. Write a list of the steps you would take to solve this problem: A pack of plums costs 68p. Mark bought three packs of plums. How much change did he get from a £5 note? Explain to the class why you solved the problem in that way.

Learning overview

Children **create sequences** by counting on and back from any start number in equal steps such as 19 or 25. They record sequences on number lines. They describe and **explain the patterns** in a sequence. For example, when subtracting 19 to generate the sequence 285, 266, 247, …, they explain that subtracting 19 is equivalent to subtracting 20 then adding 1, so the tens digit gets smaller by 2 each time and the units digit increases by 1. They use patterns to predict the next number (228) and explore what happens when the hundreds boundary is crossed.

Children explore sequences using the ITP 'Twenty cards' or the Flash program 'Counter'.



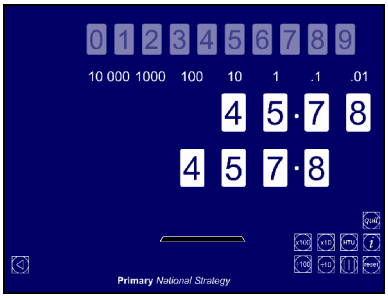


They identify the rule for a given sequence. They use this to continue the sequence or identify missing numbers, e.g. they find the missing numbers in the sequence 89, ☐, 71, 62, ☐, recognising that the rule is 'subtract 9'. They explore sequences involving **negative numbers** using a number line. For example, they continue the sequence –35, –31, –27, … by recognising that the rule is 'add 4'.

Children **read and write large whole numbers**. For example, they work in pairs using a set of cards containing six- and seven-digit numbers: one child takes a card and reads the number in words; their partner keys the number they hear into a calculator; they check that the calculator display and the number card match. Children recognise the value of each digit and they use this to **compare and order numbers**; for example, they explain which is the greater value, the 5 in 3 215 067 or the 5 in 856 207. They compare two numbers and explain which is bigger and how they know. They solve problems such as:

Use a single subtraction to change 207 070 to 205 070 on your calculator.

Children use calculators (possibly by setting a constant function) or the ITP 'Moving digits' to explore the effect of repeatedly multiplying/dividing numbers by 10.



They compare the effect of multiplying a number by 1000 with that of multiplying the number by 10 then 10 then 10 again (and similarly for division). They use digit cards and a place value grid to practise **multiplying and dividing whole numbers by 10, 100 or 1000** and answer questions such as:

32 500 ÷ ☐ = 325

How many £10 notes would you need to make £12 000?

Children rehearse multiplication facts and use these to derive division facts, to find factors of two-digit numbers and to multiply multiples of 10 and 100, e.g. 40 × 50. They **use and discuss mental**

strategies for special cases of harder types of calculations, for example to work out 274 + 96, 8006 – 2993, 35 × 11, 72 ÷ 3, 50 × 900. They use factors to work out a calculation such as 16 × 6 by thinking of it as 16 × 2 × 3. They record their methods using diagrams (such as number lines) or jottings and explain their methods to each other. They compare alternative methods for the same calculation and discuss any merits and disadvantages. They record the method they use to solve problems such as:

How many 25p fruit bars can I buy with £5?

Find three consecutive numbers that total 171.

Children consolidate **written methods for addition and subtraction**. They explain how they work out calculations, showing understanding of the place value that underpins written methods. They continue to move towards more efficient recording, from expanded methods to compact layouts.

Addition examples:

$$\begin{array}{r} 47 \\ +\ 76 \\ \hline 123 \\ 1\,1 \end{array} \qquad \begin{array}{r} 258 \\ +\ 87 \\ \hline 345 \\ 1\,1 \end{array} \qquad \begin{array}{r} 366 \\ +458 \\ \hline 824 \\ 1\,1 \end{array}$$

Carry digits are recorded below the line, using the words 'carry ten' or 'carry one hundred', not 'carry one'.

Subtraction, illustrating 'difference', is complementary addition or counting up:

$$\begin{array}{r} 74 \\ -27 \\ \hline \end{array}$$

3 to make 30
44 to make 74
47

$$\begin{array}{r} 326 \\ -178 \\ \hline \end{array}$$

2 → 180
20 → 200
100 → 300
26 → 326
148

The decomposition method, illustrating the 'take away' model of subtraction, begins like this:

Example: 74 − 27

$$\begin{array}{r} 70 + 4 \\ -\ 20 + 7 \\ \hline \end{array} \qquad \begin{array}{r} {\scriptstyle 60}\ {\scriptstyle 14} \\ \cancel{70} + \cancel{4} \\ -\ 20 + 7 \\ \hline 40 + 7 \end{array} \qquad \begin{array}{r} {\scriptstyle 6}\ {\scriptstyle 14} \\ \cancel{7}\ \cancel{4} \\ -\ 2\ 7 \\ \hline 4\ 7 \end{array}$$

The adjustment is recorded above the calculation and is described as 'borrow ten', not 'borrow one'.

Children use written methods to solve problems and puzzles such as:

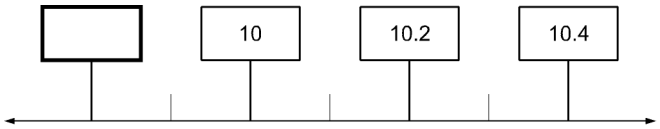
Choose any four numbers from the grid and add them. Find as many ways as possible of making 1000.

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

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?

Unit 5A2 — 2 weeks

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols *I can explain my method for solving a problem clearly to others. I listen to other children's methods. I talk about which is the most efficient method*	Tell me how you solved this problem How was Ann's method different from yours? What would you do differently if you were to solve this problem again?
• Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use *I can explain why I chose to work mentally, or use a written method or a calculator*	Would you use a mental, written or calculator method to solve each of these? Explain your choice. 23.5 × □ = 176.25 *How many cartons of juice costing 30p each can I buy with £2?* *What is the total cost if I buy food costing £3.86 and £8.57?*
• Count from any given number in whole-number and decimal steps, extending beyond zero when counting backwards; relate the numbers to their position on a number line *I can count in decimal steps to create a sequence*	What is the next number in this sequence: 0, 0.2, 0.4, 0.6, 0.8? Why is 'nought point ten' not correct? What is the rule for this sequence: 3, 2.7, 2.4, …? Suggest some other numbers that will be in the sequence. Write in the missing number on this number line. 
• Explain what each digit represents in whole numbers and decimals with up to two places, and partition, round and order these numbers *I can say what any digit in a decimal is worth*	What decimal is equal to 25 hundredths? Write the total as a decimal: $4 + \frac{6}{10} + \frac{2}{100} =$ Write a number in the box to make this correct: 6.45 = 6 + 0.4 + □ Write the value of the 5 in 12.53 as a fraction. Now write it as a decimal. On the number line, which of these numbers is closest to 1? 0.1 0.9 1.2 1.9 Tell me a number that lies between 4.1 and 4.2. What value does the 7 represent in each of these numbers? 3.7, 7.3, 0.37, 7.07 What if I put a £ sign in front of each of them? What if they are all lengths given in metres?
• Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34) *I can work out sums and differences of decimals*	Look at these calculations with two-digit decimals. Tell me how you could work them out in your head.

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Use efficient written methods to add and subtract whole numbers and decimals with up to two places *I can explain each step when I add or subtract decimals using a written method* *I can decide when it is sensible to use a written method for addition or subtraction*	Find two numbers between 3 and 4 that total 7.36. Use a written method to check your answer. Two numbers have a difference of 1.58. One of the numbers is 4.72. What is the other? Is this the only answer? What tips would you give to someone to help with column addition/subtraction? Which of these calculations are correct? Which are incorrect? [Show an incorrect calculation, e.g. one with misaligned decimal points.] What has this person done wrong? How would you help them to correct it?
• Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100; derive quickly corresponding division facts *I know my tables to 10 for multiplication facts and division facts. I can use these facts to multiply multiples of 10 and 100*	Divide 90 by 3. Five times a number is 300. What is the number? How many sevens are there in 210?
• Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9) *I can find all the factor pairs for a two-digit number*	What is the smallest whole number that is divisible by 5 and by 3? Tell me a number that is both a multiple of 4 and a multiple of 6. How can you use factors to multiply 18 by 15? How can you use factors to divide 96 by 12?
• Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 or 1000 *I can multiply or divide numbers by 10, 100 or 1000*	Write in the missing number: 3400 ÷ □ = 100 Write what the four missing digits could be: □□□ ÷ 10 = 3□ What number is ten times as big as 0.05? How do you know that it is ten times 0.05? Divide 31.5 by 10. I divide a number by 10, and then again by 10. The answer is 0.3. What number did I start with? How do you know? How would you explain to someone how to multiply a decimal by 10?
• Extend mental methods for whole-number calculations, for example to multiply a two-digit by a one-digit number (e.g. 12 × 9), to multiply by 25 (e.g. 16 × 25), to subtract one near multiple of 1000 from another (e.g. 6070 – 4097) *I can identify calculations that I can do in my head or with jottings*	One orange costs 15 pence. How much would five oranges cost? How did you work it out? Could you do it differently? Four bananas cost 68 pence. How much is one banana? Is there another way to do it? Which of these calculations would you work out mentally, using jottings if you wish? 9 × 25 3456 + 1999 6007 – 1995 14 × 6 96 ÷ 8 Why is it possible to solve these mentally? What clues did you look for? Explain your methods. Suggest a subtraction calculation involving four-digit numbers that you would answer by counting on.
• Use a calculator to solve problems, including those involving decimals or fractions (e.g. to find $\frac{3}{4}$ of 150 g); interpret the display correctly in the context of measurement *I can use a calculator to solve a problem. I can explain what calculations I keyed into the calculator and why*	What calculation can you key into your calculator to solve this problem? A piece of ribbon 2.1 metres long is cut into six equal pieces. How long is each piece? What is the answer?

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Use knowledge of rounding, place value, number facts and inverse operations to estimate and check calculations *I can estimate and check the result of a calculation*	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? Find two different ways to check the accuracy of this answer.
• Analyse the use of persuasive language *I can explain solutions to problems so that others can follow the stages. I can choose words and draw diagrams to help them to understand*	Are all the steps of your explanation in the right order? Would your description of your method be more persuasive if you explained why it is particularly suitable for those numbers? Look at this list of the steps to take to solve this problem: A pack of plums costs 68p. Mark bought three packs of plums. How much change did he get from a £5 note? Could the list be improved? How?

Learning overview

Children **secure understanding of the value of each digit in decimals** to two places. For example, they use coins (£1, 10p and 1p) or base-10 apparatus (with a 'flat' representing one whole) to model the number 2.45, recognising that this number is made up of 2 wholes, 4 tenths and 5 hundredths. They understand the relationship between hundredths, tenths and wholes and use this to answer questions such as:

Which of these decimals is equal to $^{19}/_{100}$? 1.9 10.19 0.19 19.1

How many hundredths are the same as three tenths?

Children use images such as bead strings or number lines to help them **count in tenths and hundredths** from various start numbers. They **position decimals on number lines**, explaining for example that 2.85 lies halfway between 2.8 and 2.9. They suggest numbers that lie between, say, 13.5 and 13.6. Children **create and continue sequences of decimals**, e.g. counting up from zero in steps of 0.2 or backwards from 3 in steps of 0.3. They identify the rule for a given sequence and use this to find the next or missing terms, e.g. finding the missing numbers in the sequence: 1.4, ☐, 1.8, 2, 2.2, ☐. They use counting to answer questions such as 0.2 × 6 or 1.8 ÷ 0.3, explaining how they worked out the answer.

Children **partition decimals** using both decimal and fraction notation, for example, recording 6.38 as 6 + $^{3}/_{10}$ + $^{8}/_{100}$ and as 6 + 0.3 + 0.08. They write a decimal given its parts: e.g. they record the number that is made from 4 wholes, 2 tenths and 7 hundredths as 4.27. They apply their understanding in activities such as:

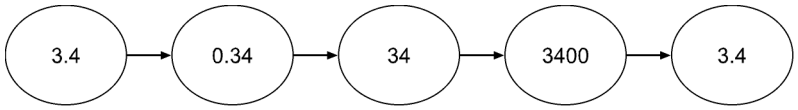
Find the missing number in 17.82 – ☐ = 17.22.

Play 'Zap the digit': In pairs, choose a decimal to enter into a calculator, e.g. 47.25.
Take turns to 'zap' (remove) a particular digit using subtraction. For example, to 'zap' the 2 in 47.25, subtract 0.2 to leave 47.05.

Children extend their understanding of **multiplying and dividing by 10, 100 or 1000 to decimals**. They use digit cards and a place value grid to practise multiplying and dividing numbers by 10, 100 and 1000, e.g. moving each digit two columns to the right to work out that 132 ÷ 100 = 1.32. They recognise that as each digit moves one column to the right, its value becomes 10 times smaller (and the reverse for multiplication). They apply this understanding in a range of activities such as:

Find the missing number in 0.42 × ☐ = 42.

Play 'Stepping stones': Work out what operation to enter into a calculator to turn the number in one stepping stone into the number in the next stepping stone.



Children **extend written methods for addition to include numbers** with one and two decimal places. They use their understanding that 10 tenths make one whole and 10 hundredths make one tenth to explain each stage of their calculation, for example, to add 72.8 km and 54.6 km.

$$\begin{array}{r} 72.8 \\ +\ 54.6 \\ \hline 127.4 \\ \hline 1 \end{array}$$

8 tenths add 6 tenths makes 14 tenths, or 1 whole and 4 tenths.
The 1 whole is 'carried' into the units column and the 4 tenths is written in the tenths column.

With subtraction of three-digit numbers and decimals, some children may be ready to use more compact methods. The number of steps in the vertical recording of the 'counting up' method is reduced.

For 326 – 178, they extend their understanding of 'difference' by counting up from 178 to 326, initially using an empty number line and then moving on to vertical recording.

$$\begin{array}{rl} 326 & \\ -178 & \\ \hline 2 & \rightarrow 180 \\ 20 & \rightarrow 200 \\ 100 & \rightarrow 300 \\ 26 & \rightarrow 326 \\ \hline 148 & \end{array}$$

$$\begin{array}{r} 326 \\ -178 \\ \hline 22 \\ 126 \\ \hline 148 \end{array} \quad \begin{array}{l} \\ \\ \rightarrow 200 \\ \rightarrow 326 \end{array}$$

$$\begin{array}{rl} 4.25 & \\ -1.83 & \\ \hline 0.17 & \rightarrow 2.00 \\ 2.25 & \rightarrow 4.25 \\ \hline 2.42 & \\ \hline 1 & \end{array}$$

The examples below work towards the decomposition method.

Example: 563 – 248, adjustment from the tens to the ones, or 'borrowing ten'

$$\begin{array}{r} 500 + 60 + 3 \\ -\ 200 + 40 + 8 \\ \hline \end{array} \qquad \begin{array}{r} 500 + \overset{50}{\cancel{60}} + \overset{13}{\cancel{3}} \\ -\ 200 + 40 + 8 \\ \hline 300 + 10 + 5 \end{array} \qquad \begin{array}{r} 5\,\overset{5}{\cancel{6}}\,\overset{13}{\cancel{3}} \\ -\ 2\ 4\ 8 \\ \hline 3\ 1\ 5 \end{array}$$

Discuss how 60 + 3 can be partitioned into 50 + 13. The subtraction of the ones becomes 'thirteen minus eight', a known fact.

Example: 563 – 271, adjustment from the hundreds to the tens, or 'borrowing one hundred'

$$\begin{array}{r} 500 + 60 + 3 \\ -\ 200 + 70 + 1 \\ \hline \end{array} \qquad \begin{array}{r} \overset{400}{\cancel{500}} + \overset{160}{\cancel{60}} + 3 \\ -\ 200 + 70 + 1 \\ \hline 200 + 90 + 2 \end{array} \qquad \begin{array}{r} \overset{4}{\cancel{5}}\,\overset{16}{\cancel{6}}\,3 \\ -\ 2\ 7\ 1 \\ \hline 2\ 9\ 2 \end{array}$$

Discuss how 500 + 60 can be partitioned into 400 + 160. The subtraction of the tens becomes '160 minus 70', an application of subtraction of multiples of ten.

Children continue to rehearse their **recall of multiplication and division facts** and use these facts and their knowledge of place value to **multiply and divide multiples of 10 and 100**. They use jottings to record, support or explain mental multiplication and division of TU by U, forging links to the written methods that they are developing and refining.

Example: 38 × 7

38 × 7 = (30 × 7) + (8 × 7) = 210 + 56 = 266

×	7
30	210
8	56
	266

The number with the most digits is placed in the left-hand column of the grid so that it is easier to add the partial products.

	30 + 8
×	7
	210
	56
	266

The next step is to move the number being multiplied (38) to an extra row at the top of the grid.

Presenting the grid like this helps children to set out and add the partial products 210 and 56.

$$\begin{array}{r} 30+8 \\ \times\ \ 7 \\ \hline 210 \\ \underline{\ 56} \\ 266 \end{array} \qquad \begin{array}{l} 30\times 7=210 \\ 8\times 7=\ \ 56 \end{array}$$

The next step is to represent the method of recording to a column format, but showing the working. Point out the links with the grid method.

$$\begin{array}{r} 38 \\ \times\ \ 7 \\ \hline 210 \\ \underline{\ 56} \\ 266 \end{array}$$

Children should describe what they do by referring to the actual values of the digits in the columns (e.g. the first step in 38 × 7 is 'thirty multiplied by seven', not 'three times seven', although the relationship to 3 × 7 should be stressed).

Children use the multiplication and division facts that they know to find **factors** of numbers, for example, determining that 35 has a factor pair of 7 and 5, so 350 has a factor pair of 70 and 5 or 7 and 50. They use their knowledge of factors for special cases of multiplication and division calculations. For example, to multiply 15 by 6, they work out 15 × 3 × 2 = 45 × 2 = 90, and to divide 72 by 6 they halve it to get 36, then divide by 3. They find **common multiples**, investigating questions such as:

What is the smallest whole number that is divisible by 5 and by 3?

Tell me a number that is both a multiple of 4 and a multiple of 6. Are there any other possibilities?

Children **solve a range of one- and two-step word problems**, choosing whether to use mental, written or calculator methods. They record their method in a clear and logical way, using jottings and diagrams where appropriate. They compare their methods with others, recognising where another method is more efficient than the one that they chose. They solve inverse operation problems such as 3.42 + □ = 10, and word problems such as:

Emma saves £3.50 each week. How much has she saved after 16 weeks?

I buy presents costing £9.63, £5.27 and £3.72. How much change do I have from £20?

One bag of sugar weighs 2.2 pounds. How much will 10 bags of sugar weigh?

Zak saves half of his pocket money each month. In one year he saves £51. How much pocket money does he get each month?

Unit 5A3 2 weeks

<table>
<tr><th>Objectives
Children's learning outcomes in italic</th><th>Assessment for learning</th></tr>
<tr><td>• Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols
I can record my method for solving a problem so that I show each step. I record only what I need to, using symbols where I can</td><td>Tell me how you solved this problem
What does this calculation/diagram tell you?
What does the answer to this calculation tell you?
Asim and Mike both buy 12 cans of lemonade.
Asim buys 3 packs of 4 cans at £1.20 for each pack.
Mike buys 2 packs of 6 cans at £1.70 for each pack.
Mike says to Asim: 'You paid 50p more than me.'
Is Mike correct? Circle Yes or No.
Explain how you know.

On Sports Day children get points for how far they jump.
Joe jumped 138 cm. How many points does he get?
Sam said: 'I jumped 1.5 metres. I get 4 points.' Give a reason why Sam is correct.

<table><tr><th colspan="3">Standing Long Jump</th></tr><tr><td>Over</td><td>80 cm</td><td>1 point</td></tr><tr><td>Over</td><td>100 cm</td><td>2 points</td></tr><tr><td>Over</td><td>120 cm</td><td>3 points</td></tr><tr><td>Over</td><td>140 cm</td><td>4 points</td></tr><tr><td>Over</td><td>160 cm</td><td>5 points</td></tr><tr><td>Over</td><td>180 cm</td><td>6 points</td></tr></table></td></tr>
<tr><td>• Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use
I can choose what calculation to do when I solve problems with decimals
I can make sensible decisions about when to use a calculator</td><td>A fruit pie costs 55 pence. What is the cost of three fruit pies?
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?
There are 70 children. Each tent takes up to 6 children.
What is the least number of tents they will need?
The table shows the cost of coach tickets to different cities.

<table><tr><th colspan="2"></th><th>Hull</th><th>York</th><th>Leeds</th></tr><tr><td rowspan="2">Adult</td><td>single</td><td>£12.50</td><td>£15.60</td><td>£10.25</td></tr><tr><td>return</td><td>£23.75</td><td>£28.50</td><td>£19.30</td></tr><tr><td rowspan="2">Child</td><td>single</td><td>£8.50</td><td>£10.80</td><td>£8.25</td></tr><tr><td>return</td><td>£14.90</td><td>£17.90</td><td>£14.75</td></tr></table>
What is the total cost for a return journey to York for one adult and two children? How much more does it cost for two adults to make a single journey to Hull than to Leeds?</td></tr>
<tr><td>• Explain what each digit represents in whole numbers and decimals with up to two places, and partition, round and order these numbers
I can say the value of each digit in a number, including decimals. I can partition a decimal in different ways.</td><td>Write a decimal that contains 3 units and 7 hundredths
I started with a number and rounded it to the nearest whole number. The answer was 13. What number could I have started with?
Write a number that is bigger than 0.3 but smaller than 0.4.
Some children run a 100 metres race on Sports Day. Here are their times in seconds.

<table><tr><th>Name</th><th>Time taken</th></tr><tr><td>Sue</td><td>15.97 s</td></tr><tr><td>Jan</td><td>16.39 s</td></tr><tr><td>Sam</td><td>14.83 s</td></tr><tr><td>Tom</td><td>17.00 s</td></tr><tr><td>Raj</td><td>15.89 s</td></tr></table>
What is the winner's time?
Who has the time nearest to 16 seconds?</td></tr>
</table>

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Count from any given number in whole-number and decimal steps, extending beyond zero when counting backwards; relate the numbers to their position on a number line *I can find missing numbers in a sequence that contains decimals*	Write the next number in this counting sequence: 8.7, 8.8, 8.9, … Create a sequence that includes the number 1.6. Describe your sequence. Here is part of a sequence: 3, 2.7, 2.4, ☐, 1.8, 1.5, ☐. How can you find the missing numbers?
• Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100; derive quickly corresponding division facts *I know my tables to 10 for multiplication facts and division facts. I can use these facts to multiply multiples of 10 and 100*	Multiply 60 by 50. Write in the missing number: 8 × ☐ = 400 How many thirties are there in 600?
• Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34) *I can work out sums, differences, halves and doubles of decimals with two digits*	Look at these calculations with two-digit decimals. Tell me how you could work them out in your head. What other method could you use?
• Refine and use efficient written methods to multiply and divide HTU × U, TU × TU, U.t × U and HTU ÷ U *I can divide a three-digit number by a one-digit number using a written method. I can explain each step of my calculation* *I can multiply a decimal with one place by a one-digit number using a written method. I can explain each step of my calculation*	There are 12 pencils in a box. A school buys 24 boxes. How many pencils does the school buy? Talk me through your method. Write in the missing digits to make this correct. ☐ 4 ☐ × 6 2 0 5 2 Calculate 847 ÷ 7. Roughly, what answer do you expect to get? How did you arrive at that estimate? Do you expect your answer to be less than or greater than your estimate? Why? Look at these worked examples. Is this one correct? How do you know? How could we put it right?
• Use a calculator to solve problems, including those involving decimals or fractions (e.g. to find ¾ of 150 g); interpret the display correctly in the context of measurement *I can clear the display of the calculator before I enter a calculation* *I make sure that amounts are in the same unit when I use a calculator to solve money and measures problems*	Find the total of 1.58 m, 79 cm and 1.23 cm using a calculator. Did you key in the numbers as 1.58, 79 and 1.23? Why not? What answer does the calculator give? What is the total of the three lengths?

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Use knowledge of rounding, place value, number facts and inverse operations to estimate and check calculations *I can estimate and check the result of a calculation*	Roughly, what answer do you expect to get? How did you arrive at that estimate? Is this calculation correct? How do you know?
• Understand the process of decision making *I can explain why I decided to use a particular method to solve a problem. I can describe what was special about the problem that prompted my decisions*	Why did you decide to use a mental/written/calculator method for this calculation? Why did you decide to change all the units to metres rather than centimetres? Why did you decide to use the scales rather than the balance?

Learning overview

Children **describe how to find or place decimals to two decimal places on a number line**; for example, they explain that 3.72 is between 3 and 4 and that it lies 2 hundredths along from 3.7. They **round decimals to the nearest whole number**, recognising that 3.72 is closer to 4 than to 3, so 3.72 rounded to the nearest whole number is 4. They **order a set of decimals** such as 5.51, 3.75, 7.35, 5.73, 3.77, appreciating that the most significant digit defines the size of a number and is the left-most non-zero digit. They appreciate the role of zero as a place holder; for example, they write the number 'one and four hundredths' as 1.04 and can place it appropriately on a number line from 1 to 2. They use number lines to solve problems such as:

State a number that lies between 4.1 and 4.2.

Which number lies exactly halfway between 8.2 and 8.8? 6.35 and 6.75? 1.2 and 1.5?

Place a digit in the box so that the number 3.□4, when rounded to the nearest whole number, is 3. How many possibilities are there?

Children count in decimal steps, for example in steps of 0.4 or 0.09. They compare these sequences to those involving whole numbers, comparing, for example, the count 0.4, 0.8, 1.2, … to the count 4, 8, 12, … They use this relationship to answer related questions such as 0.4 × 7 (Where do we land after 7 hops of 0.4?) or 3.2 ÷ 0.4 (How many hops of 0.4 are needed to reach 3.2?). They count using measures, for example in steps of 0.2 kg.

Children use a calculator to solve one- and two-step word problems involving decimals in the context of money and measures. They solve problems such as:

A roll contains 10 m of tape. Four people use the tape to wrap presents. They use 1.27 m, 2.45 m, 96 cm and half a metre. How much tape is left?

How many litre cartons of juice do I need to fill 18 cups each containing 0.3 litres?

How much change will I get from £10 if I buy groceries costing £2.29, £1.42, 76p and £3.83?

How many dollars, euros or yen do you get for £5?

£1 = 1.8 US dollars
£1 = 1.47 euros
£1 = 210.9 yen

They clear the calculator display before entering a calculation. They recognise the need to be consistent with units when entering money and measures. They interpret the answer shown on the calculator display appropriately (recognising, for example, that a display of 2.4 in the context of money represents £2.40) and give the answer using correct units where appropriate. They **use rounding to estimate and check their answers**.

Children use their understanding of whole-number and decimal place value to **extend written methods for multiplication and division** (including TU × TU, U.t × U and HTU ÷ U).

For TU × TU, estimate first.

56 × 27 is approximately 60 × 30 = 1800.

Start with the grid method. The partial products in each row are added, then the two sums at the end of each row are added to find the total product.

×	20	7	
50	1000	350	1350
6	120	42	162
			1512
			1

The first column becomes an extra top row as a stepping stone to the method below.

	50	6	
×	20	7	
	1000	350	1350
	120	42	162
			1512
			1

When children are confident, reduce the recording, showing the links to the grid method above.

56 × 27 is approximately 60 × 30 = 1800.

$$\begin{array}{r} 56 \\ \times\ 27 \\ \hline 1000 \\ 120 \\ 350 \\ 42 \\ \hline 1512 \\ 1 \end{array} \qquad \begin{array}{l} 50 \times 20 = 1000 \\ 6 \times 20 = 120 \\ 50 \times 7 = 350 \\ 6 \times 7 = 42 \end{array}$$

For TU ÷ U, begin with 'chunking', which is based on subtracting multiples of the divisor.

196 ÷ 6

$$\begin{array}{rl} 6\overline{)196} & \\ -\ 60 & 6 \times 10 \\ \hline 136 & \\ -\ 60 & 6 \times 10 \\ \hline 76 & \\ -\ 60 & 6 \times 10 \\ \hline 16 & \\ -\ 12 & 6 \times 2 \\ \hline 4 & 32 \end{array}$$

Answer: 32 R 4

Chunking is useful for reminding children of the link between division and repeated subtraction. However, chunking is inefficient if too many subtractions have to be carried out. When children understand the principles, encourage them to reduce the number of steps and to subtract the largest possible multiples.

The key to the efficiency of chunking lies in the estimate that is made before the chunking starts. Estimating for HTU ÷ U involves multiplying the divisor by multiples of 10 to find the two multiplies that 'trap' the HTU dividend.

Estimating has two purposes: to check the answer after the calculation, and to help to choose a starting point for the division.

Children who have a secure knowledge of multiplication facts and place value should be able to move on quickly to more efficient recording.

To find 196 ÷ 6, we start by multiplying 6 by 10, 20, 30, …, to find that 6 × 30 = 180 and 6 × 40 = 240. The multiples of 180 and 240 trap the number 196. So the answer to 196 ÷ 6 is between 30 and 40.

We start the division by first subtracting 180, leaving 16, and then subtracting the largest possible multiple of 6, which is 12, leaving 4.

$$\begin{array}{rl} 6\overline{)196} & \\ -\ 180 & 6 \times 30 \\ \hline 16 & \\ -\ 12 & 6 \times 2 \\ \hline 4 & 32 \end{array}$$

Answer: 32 R 4

Children use written calculations (and work methodically) to solve problems such as:

Place three digits to make a U.t × U calculation. Find examples where the answer is a whole number.

Place a digit in the box so that the answer to the calculation 8□1 ÷ 7 has no remainder.

Children solve word problems and number puzzles using all four operations. They **record their methods clearly and logically using jottings or diagrams where appropriate**. They **explain their method and justify their choices**. They solve problems/puzzles such as:

The perimeter of an equilateral triangle is 285 cm. What is the length of each side?

Place a decimal in each box to make the calculation correct: □ + □ + □ = 1.
Find different ways of doing it, including some that use numbers with two decimal places.

Place an operation symbol (+, –, × or ÷) in each circle to make the answer correct:
(37 ○ 21) ○ 223 = 1000.