Autumn Block 2

Addition and subtraction

Small steps

Step 1	Mental strategies
Step 2	Add whole numbers with more than four digits
Step 3	Subtract whole numbers with more than four digits
Step 4	Round to check answers
Step 5	Inverse operations (addition and subtraction)
Step 6	Multi-step addition and subtraction problems
Step 7	Compare calculations
Step 8	Find missing numbers

Mental strategies

Notes and guidance

In this small step, children recap and build on their learning from previous years to mentally calculate sums and differences using partitioning. They use their knowledge of number bonds and place value to add and subtract multiples of powers of 10. Children unitise to help them complete a calculation. For example, if they know that 3 + 5 = 8, then 3 thousand + 5 thousand = 8 thousand and 3,000 + 5,000 = 8,000

Children also count forwards and backwards in multiples of powers of 10 to answer questions such as 1,050 – 100 without the need for a formal written method.

Children explore strategies such as compensation and adjustment to mentally calculate the answer to questions such as 14,352 + 999 or 14,352 – 999. This helps them to make connections between calculations and will be developed further in Year 6

Things to look out for

- Children need to be fluent in their knowledge of number bonds to support the mental strategies.
- Children may opt to use a formal method even when this is time-consuming and/or inappropriate.

Key questions

- How does knowing that 2 + 5 = 7 help you to work out 20,000 + 50,000?
- How can the numbers be partitioned to help add/subtract them?
- Are any of the numbers multiples of powers of 10? How does this help you to add/subtract them?
- What number is 999 close to? How does that help you to add/subtract 999 from another number?

Possible sentence stems

- The sum of _____ ones and _____ ones is _____ ones, so the sum of _____ thousands and _____ thousands is _____ thousands.
- I can partition the number into _____, _____ and _____ and add the parts separately.

National Curriculum links

- Add and subtract numbers mentally with increasingly large numbers

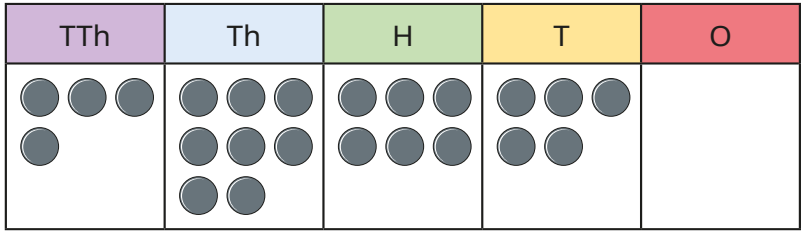
Mental strategies

Key learning

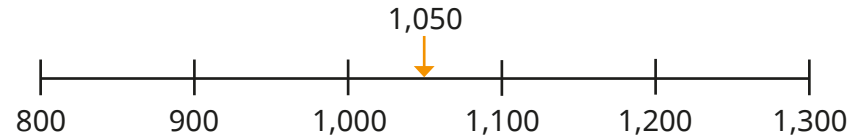
- Use the fact that 8 + 4 = 12 to work out the additions.
  - 8,000 + 4,000
  - 800 + 400
  - 80,000 + 40,000

- Find the sum of each pair of numbers.
  - 300,000 and 400,000
  - 62,000 and 6,000
  - 110,000 and 230,000
  - 5,020 and 9,060

- Use the place value chart to help you work out the subtractions.

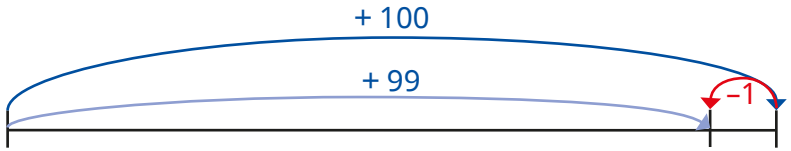


  - 48,650 – 3,000
  - 43,650 – 200
  - 43,650 – 10
  - 48,650 – 3,210
  - 48,650 – 7,100
  - 48,650 – 5,030

- 

  Use the number line to help you work out the calculations.
  - 1,050 + 100
  - 1,050 – 100

- The number line shows a method for adding 99 mentally.



  Use the number line to help you add 99 to 687

  Use a similar number line to help you subtract 99 from 687

- Work out the calculations.

3,724 + 999	3,724 – 999
3,724 + 990	3,724 – 990

- Work out the calculations.

46 + 29	460 + 290	460 + 299
59 + 59	590 + 590	599 + 599

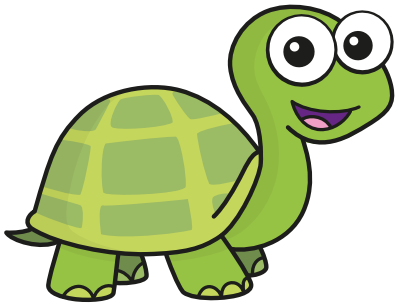
  What mental strategies did you use?

Mental strategies

Reasoning and problem solving

Tiny is using mental strategies to add numbers.

I know
800 + 300 = 1,100,
so 4,826 + 300 = 41,126

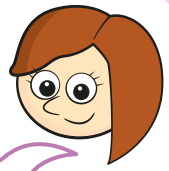


Explain why Tiny is wrong.

Find the correct answer to
4,826 + 300

5,126

Rosie is working out a subtraction.



1,000 – 372 = 999 – 371

Explain why Rosie is correct.

Work out the answer to
1,000 – 372

Use this strategy to work out the subtractions.

1,000 – 625

10,000 – 6,832

100,000 – 47,356

628

375

3,168

52,644

Add whole numbers with more than four digits

Notes and guidance

In this small step, children revisit the use of the column method for addition and learn to apply this method to numbers with more than four digits.

A range of representations can be used for support in this step, including place value counters and place value charts. These representations are particularly useful when performing calculations that require an exchange. Children may find it easier to work with squared paper and labelled columns as this will support them in placing the digits in the correct columns, especially with figures containing different numbers of digits.

If appropriate, children could practise their rounding skills to estimate the answer before working out the calculation, and then use it as a sense-check for their solution. This skill is covered in detail later in this block.

Things to look out for

- Children may not line up the numbers in the columns correctly.
- Children may write the exchanged digits in the wrong column(s).
- Children who are not secure in their number bonds may make numerical errors within columns.

Key questions

- Does it matter which number goes at the top when using the column method?
- Will you need to make an exchange? Which columns will be affected if you do? How do you know?
- Does it matter if the numbers have different numbers of digits?
- How do you know which digits to "line up" in the calculation?
- How do you know if the calculation is an addition?

Possible sentence stems

- In column addition, we start from the place value column that has the _____ value.
- The _____ is in the _____ column. It represents _____

National Curriculum links

- Add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Add whole numbers with more than four digits

Key learning

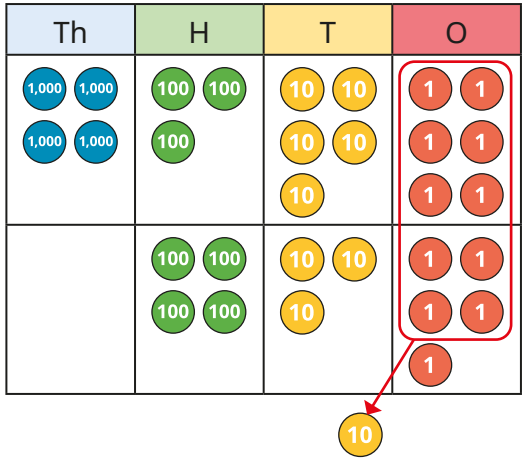
- Use the column method to work out the additions.

		4	7	
	+	3	8	

		2	4	7	
	+	5	3	8	

		3	6	4	7	
	+	4	9	2	8	

- Ron uses place value counters to calculate 4,356 + 435



		4	3	5	6
	+		4	3	5
		4	7	9	1
				1	

Use Ron's method to work out the additions.

32,461 + 4,352	48,276 + 5,613

- Jack, Kim and Eva are playing a computer game.
  - Jack has 3,452 points.
  - Rosie has 4,039 points.
  - Eva has 10,989 points.

  How many points do Jack and Rosie have altogether?

  How many points do Rosie and Eva have altogether?

  How many points do Jack and Eva have altogether?

  How many points do Jack, Rosie and Eva have altogether?

- Find the sum of seventy-three thousand, five hundred and eighty-four and twenty-eight thousand, nine hundred and nine.

- Find the answers to the calculations.

  In each case decide whether a mental method or written method is more appropriate.

12,724 + 43,610	63,800 + 2,002
9,999 + 8,712	313,500 + 89,019

Add whole numbers with more than four digits

Reasoning and problem solving

Work out the missing numbers.

		☐	4	☐	3	☐	
	+	2	☐	5	☐	2	
		7	8	5	2	9	

54,937
+ 23,592
78,529

What mistake has been made?

1,562 + 301 = 4,572

The incorrect place value has been assigned to each digit in 301

Dexter is estimating the sum of a 6-digit number and a 5-digit number.

My 6-digit number rounds to 200,000 to the nearest 10,000

I have rounded my 5-digit number to the nearest 1,000

My estimate of the total is one-quarter of a million.

What could Dexter's numbers be?

What is the greatest possible total of Dexter's numbers?

What is the smallest possible total of Dexter's numbers?

6-digit number: between 195,000 and 204,999

5-digit number: between 49,500 and 50,499

255,498

244,500

Subtract whole numbers with more than four digits

Notes and guidance

In this small step, children revisit the use of the column method for subtraction and learn to apply this method to numbers with more than four digits.

A range of representations can be used for support in this step, including place value counters and place value charts. These representations are particularly useful when performing calculations that require an exchange. Children may find it easier to work with squared paper and labelled columns as this will support them in placing the digits in the correct columns, especially with figures containing different numbers of digits.

Children should experience both questions and answers where zero appears in columns as a placeholder.

Things to look out for

- Children may always subtract the smaller digit from the larger digit instead of making an exchange when needed.
- The need for repeated exchanges may cause difficulty.
- When using the column method, children may arrange the numbers incorrectly.

Key questions

- Which number goes at the top when using the column method? Does this affect the final answer?
- Will you need to make an exchange? Which columns will be affected if you do? How do you know?
- Does it matter if the numbers have different numbers of digits?
- How do you know which digits to "line up" in the calculation?
- How do you know if the calculation is a subtraction?

Possible sentence stems

- In column subtraction, we start from the place value column that has the _____ value.
- There are not enough _____, so I need to exchange 1 _____ for 10 _____

National Curriculum links

- Add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Subtract whole numbers with more than four digits

Key learning

- Use the column method to work out the subtractions.

		8	4		
	–	3	6		

		6	3	2		
	–	4	1	7		

		4	6	8	
	–	2	9	3	

		3	1	2	5	
	–	2	4	1	7	

- Work out the subtraction.

  Use the place value chart and the column method to help you.

Tth	Th	H	T	O
10,000 10,000 10,000 10,000	1,000 1,000 1,000 1,000 1,000 1,000 1,000	100 100 100 100 100	10 10 10	1 1 1 1 1 1

		4	5	5	3	6	
	–		8	4	2	6	

- There are 43,662 fans at a football match.

  31,547 of the fans are adults.

  How many of the fans are not adults?

- The population of Hereford is 63,689

  The population of Chester is 87,593

  Find the difference between the population of Hereford and the population of Chester.

- Subtract twelve thousand, three hundred and seventy from eighteen thousand, one hundred and twenty-four.

- Find the answers to the calculations.

  In each case, decide whether a mental method or written method is more appropriate.

12,000 – 2	46,312 – 15,000
35,295 – 16,359	90,000 – 23,518

Subtract whole numbers with more than four digits

Reasoning and problem solving

Work out the missing numbers.

		5		4		8	
	–		1		2		
		2	0	8	5	8	

52,478
– 31,620
20,858

623 + 754 = 1,377

Use the calculation to complete the number sentences.

_____ – 754 = 623

_____ – 6,230 = 7,540

137,700 – 75,400 = _____

1,377

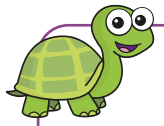
13,770

62,300

Work out the missing numbers.

		6		2		6	
	–		8		7		
		3	6	7	4	4	

65,216
– 28,472
36,744



Tiny is working out a subtraction.

53,209 – 27,452 = 34,257

What mistake has Tiny made?

Instead of making exchanges, Tiny has found the difference between the digits in each place value column.

Round to check answers

Notes and guidance

In this small step, children practise rounding in order to estimate the answers to both additions and subtractions. They also review mental strategies for estimating answers.

Children should be familiar with the word "approximate", and the degree of accuracy to which to round is a useful point for discussion. Generally, rounding to the nearest 100 for 3-digit numbers, the nearest 1,000 for 4-digit numbers and so on is appropriate, but there is no need to formally introduce the language and idea of "rounding to one significant figure" at this stage.

Children may need reminding that the reason we round in this context is to produce a calculation that can easily be completed mentally.

Things to look out for

- Children may need support in deciding to what degree of accuracy they should round given numbers.
- If children have any difficulties or misconceptions with rounding this will hold them back when estimating.
- Children may forget to compare their answers with their estimates.

Key questions

- Which multiples of _____ does the number lie between?
- Which division on the number line is the number closer to?
- What is the number rounded to the nearest _____?
- What place value column should we look at to round the number to the nearest 10/100/1,000/10,000/100,000?
- How could you use your estimates to check your answers?
- Is the actual answer going to be greater or less than your estimate? Why?

Possible sentence stems

- The previous multiple of _____ is _____
- The next multiple of _____ is _____
- _____ rounded to the nearest _____ is _____
- The approximate answer is _____

National Curriculum links

- Round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000
- Add and subtract numbers mentally with increasingly large numbers
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

Round to check answers

Key learning

- Round the numbers to find an estimate of the answer to 6,789 + 2,870

  6,789 rounded to the nearest 1,000 is _____

  2,870 rounded to the nearest 1,000 is _____

  The estimated total is _____ + _____ = _____

  Compare the estimate with the actual answer.

- Round each number to the nearest 100,000 to estimate the answers to the calculations.

517,000 + 289,000	517,000 – 289,000
126,539 + 723,628	809,375 – 610,005

- Annie estimates the answer to 22,223 + 5,867 by rounding both numbers to the nearest 1,000

  Jack estimates the answer to 22,223 + 5,867 by rounding both numbers to the nearest 10,000

  Compare Annie's method with Jack's method.

  Work out the actual answer. Which estimate was closer?

- The table shows the number of tickets sold by an airline during a three-month period.

Month	Tickets sold
February	18,655
March	31,402
April	27,092

  - Work out the total number of tickets sold in February and March.

    Use an estimate to check your answer.

  - The approximate total number of tickets sold in April and May was 50,000

    Estimate the number of tickets sold in May.

- Mrs Khan wants to buy a laptop, a monitor and a keyboard.

  Mrs Khan has £1,700

  Estimate whether she can afford all three items.

Round to check answers

Reasoning and problem solving

Mo has completed an addition.

31,207 + 6,529 = 96,497

Use an estimate to show that Mo must have made a mistake.

30,000 + 7,000

= 37,000

Mo's answer is too big.

When two numbers are rounded to the nearest 10,000, their sum is 100,000

What could the numbers be? Discuss possible answers with a partner.

What is the smallest possible actual total of the numbers?

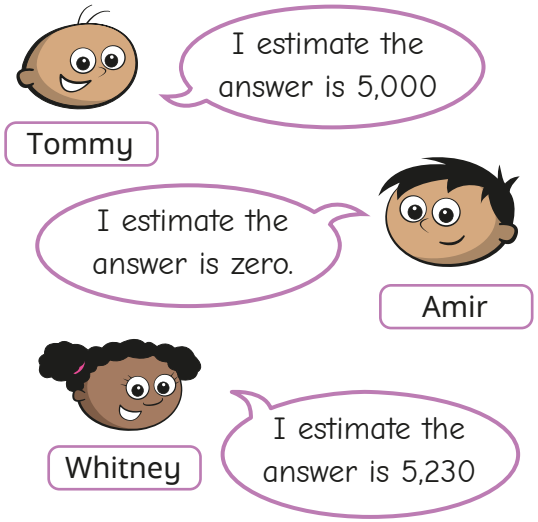
What is the greatest possible actual total of the numbers?

90,000 (e.g. 65,000 + 25,000)

109,998 (e.g. 54,999 + 54,999)

Tommy, Amir and Whitney are working out a subtraction.

64,942 – 59,713



Explain why the children all have different estimates.

Work out the actual answer.

Whose estimate is most accurate?

They rounded the numbers to different powers of 10

5,229

Whitney's

Inverse operations (addition and subtraction)

Notes and guidance

Children should know that addition and subtraction are inverse operations from learning in earlier years, and should already be aware that addition is commutative and subtraction is not.

Children can use bar models or part-whole models to establish families of facts that can be found from one calculation and then use inverse operations to check the accuracy of their calculations.

Children also use inverse operations to find unknown numbers, solving problems such as "I think of a number and add/subtract _____". This lays the groundwork for solving equations in Year 6 and beyond.

Things to look out for

- Children may see addition and subtraction as separate operations and not appreciate the connection between them.
- Children may think that subtraction is commutative.
- Children may need support to see the correct order in which to perform a subtraction to check a given addition.
- When solving "I think of a number" problems, children may use the given operation instead of the inverse operation.

Key questions

- If I add a number to another to get a total, what do you need to do to the total to find my original number?
- If I subtract a number from another to find the difference, what do you need to do to the difference to find my original number?
- What does an inverse operation do?
- What operation is the inverse of addition?
- What operation is the inverse of subtraction?

Possible sentence stems

- The inverse of _____ is _____
- To check that I have added/subtracted _____ correctly, I need to _____

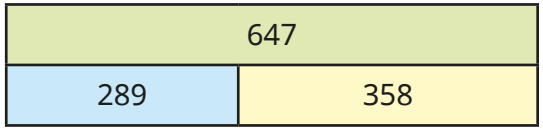
National Curriculum links

- Add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Inverse operations (addition and subtraction)

Key learning

- Write two additions and two subtractions shown by the bar model.



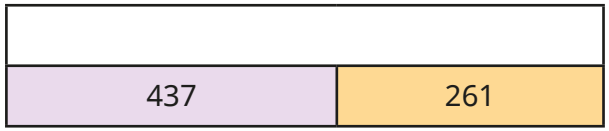
- Aisha works out an addition.

65 + 78 = 143

Which subtractions can be used to check Aisha's addition?

143 – 78 | 78 – 65 | 143 – 65 | 78 – 143

- Complete the bar model.



Check your answer using a subtraction.

- Huan thinks of a number.

He adds 17 to his number and gets the answer 40

Which calculation can be used to find Huan's number?

17 + 40 | 17 – 40 | 40 – 17 | 40 + 17

- Esther and Brett are playing a computer game.

Esther scores 8,524 points.

The total of both their scores is 19,384

How many points did Brett score?

- Dani thinks of a number.

After she adds 5,241 and subtracts 352, her new number is 9,485

What was Dani's original number?

- Find the missing numbers.
  - 654 + _____ = 837
  - _____ – 719 = 424
  - 3,820 = 5,260 – _____
  - 19,456 = 2,345 + _____

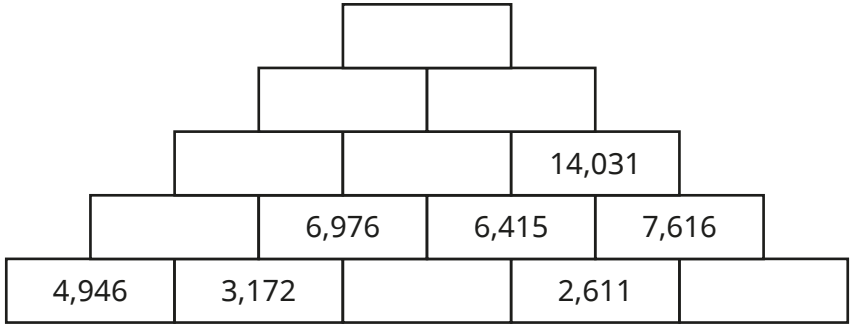
Use inverse operations to check your answers.

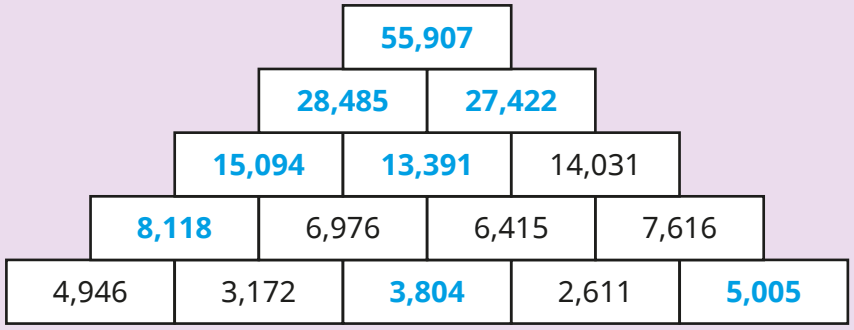
Inverse operations (addition and subtraction)

Reasoning and problem solving

In the number pyramid, each number is the sum of the two numbers below.

Use addition and subtraction to complete the pyramid.

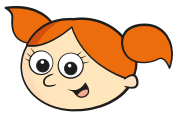




Teddy and Alex are each thinking of a number.

Teddy

98 less than my number is 465



Alex

99 more than my number is 465

Find the difference between Teddy's number and Alex's number.

98 + 99 = 197

Multi-step addition and subtraction problems

Notes and guidance

In this small step, children apply the strategies they have learned so far in this block to solve addition and subtraction problems with more than one step.

Children choose the operations needed at each step and then perform the calculations using an appropriate mental or written method. Problems are presented in both word form and with models. The use of bar models can help children to illustrate problems of this kind. While the models will not perform the calculation, they will help children to decide what operations are needed and why.

Although the focus is on addition and subtraction, sometimes division will be needed to find some of the numbers. The previous small step can also be reinforced by using inverse operations or approximations to check if answers are correct.

Things to look out for

- Children may find it difficult to interpret word problems, particularly if the context is unfamiliar.
- Children may choose the wrong operation.
- Commonly used words such as "more" can cause confusion as children assume this always means an addition is necessary.

Key questions

- What is the key information in the question?
- What can you work out straight away? How does this help you to answer the question?
- How can you represent this problem using a bar model? Which bar will be longer? Why?
- Do you need to add or subtract the numbers at this stage? How do you know?
- How can you check your answer?

Possible sentence stems

- The first step in solving the problem is ...
- When I know _____, I can then _____
- To check my answer, I can ...

National Curriculum links

- Add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Multi-step addition and subtraction problems

Key learning

- Filip is writing a report.

  He writes the first 460 words on Monday and another 735 words on Tuesday.

  The report must be at least 2,500 words long.

  How many more words does Filip need to write?

- Year 5 and Year 6 are going on a school trip.

  The school has a bus with 56 seats and a minibus with 17 seats.

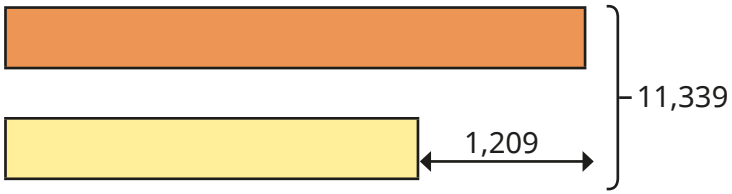
  There are 44 people in the Year 5 group and 38 people in the Year 6 group.

  How many more seats are needed for both groups to go on the trip?

- The sum of two numbers is 11,339

  The difference between the numbers is 1,209

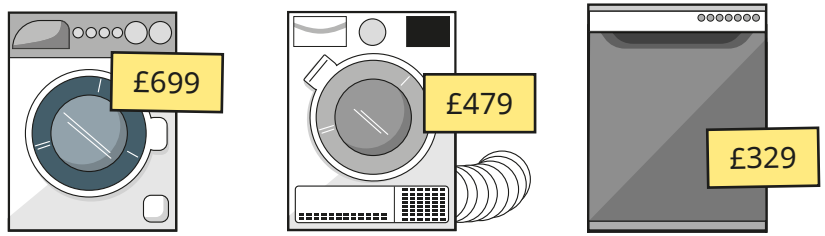
  Use the bar model to help you find the two numbers.



- Mr Rose is buying items for his home.

  He has a budget of £1,500

washing machine **tumble dryer** **dishwasher**



  He buys a washing machine and a tumble dryer.

  Does he have enough money left to buy the dishwasher?

- A pole is used to measure the depth of water in a river.

  The part of the pole above the water is 95 cm.

  The part of the pole in the water is 35 cm greater than the part of the pole above the water.

  How long is the pole?

- Annie opens a book and sees two numbered pages.

  The sum of the page numbers is 317

  What is the number of the next page in the book?

Multi-step addition and subtraction problems

Reasoning and problem solving

A milkman has 250 bottles of milk.

During the day, he collects another 160 from the dairy and delivers 375 bottles.

Nijah works out how many bottles are left.

375 – 250 = 125

125 + 160 = 285

Do you agree with Nijah?

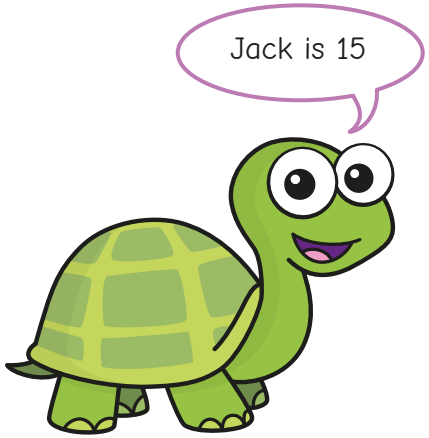
Explain your answer.

No

Mo is twice as old as Jack.

Dora is 3 years younger than Jack.

The sum of all their ages is 33



Explain the mistake Tiny has made.

How old is Jack?

9 years old

Compare calculations

Notes and guidance

In this small step, children are required to compare calculations. The focus is not on completing calculations, but instead exploring their structure in order to make a comparison. Children should understand the effect that adding to or subtracting from numbers in a calculation has on the answer to that calculation.

Bar models are a useful way of illustrating the relationships between calculations. It may be appropriate to concentrate on comparisons with 2-digit and 3-digit numbers before moving on to larger numbers.

The understanding children develop in this step will support them in the next step where they use a given fact to derive other answers. They also look at similar strategies for multiplication and division in future blocks.

Things to look out for

- When given calculations, children may automatically start to work out the answers rather than use strategies to make comparisons.
- When comparing calculations, children may not recognise two identical numbers if presented in a different order either side of the inequality symbol, for example $423 + 650 < 729 + 423$

Key questions

- What is the same and what is different about the numbers in the two calculations?
- Which digits have changed and which have stayed the same?
- How will the answer change if you increase one of the numbers by _____?
- How will the answer change if you decrease one of the numbers by _____?
- How will the answer change if you increase/decrease both of the numbers by _____?

Possible sentence stems

- If I add/subtract _____ to/from one of the numbers in the calculation, the answer will change by _____
- If I add/subtract _____ to/from both of the numbers in the calculation, the answer will change by _____

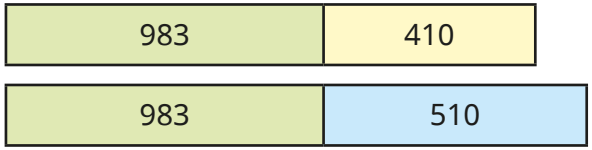
National Curriculum links

- Add and subtract numbers mentally with increasingly large numbers
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Compare calculations

Key learning

- Which calculation has the greater answer, 983 + 410 or 983 + 510?



Use the bar model to explain your answer.

- Which calculation has the greater answer?

983 – 410 983 – 510

How do you know?

- Write >, < or = to complete the calculations.

47 + 28 ◯ 37 + 28

64 + 91 ◯ 91 + 64

651 – 286 ◯ 651 – 283

- Which calculation has the greatest answer?

9,825 + 4,126 9,825 + 4,326 9,925 + 4,126

- Which calculations have an answer greater than the answer to 478 + 217?

478 + 218 479 + 217 479 + 218 477 + 317

Explain your answers.

- Which calculations have an answer greater than the answer to 5,618 – 3,257?

5,618 – 4,257 5,618 – 1,257 5,619 – 3,257 6,618 – 3,257

Explain your answers.

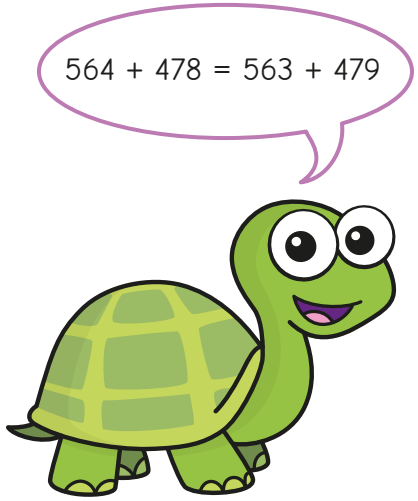
- Put the addition cards in order of size, starting with the one with the greatest answer.

463 + 127 563 + 327 483 + 127

463 + 327 463 + 337

Compare calculations

Reasoning and problem solving



Explain why Tiny is correct.

Which of the calculations have the same answer as 564 – 478?

565 – 479

563 – 479

565 – 477

563 – 477

563 is 1 less than 564 and 479 is 1 more than 478, so the total does not change.

565 – 479

563 – 477

16,853 + 23,671 = 40,524

Use the addition to work out these calculations.

16,953 + 23,671

16,883 + 23,691

40,524 – 16,853

42,524 – 16,853

40,524 – 17,853

405,240 – 236,710

Compare methods with a partner.

40,624

40,574

23,671

25,671

22,671

168,530

Find missing numbers

Notes and guidance

This small step begins with revision of the use of inverse operations to find a missing number in a calculation. Children then build on the previous small step to solve missing number problems by comparing calculations.

Children need to understand that when two numbers are increased by the same amount the difference remains the same, and that the total of two numbers remains the same if one number has been increased by an amount and the other decreased by the same amount. Bar models and/or number lines can be used to illustrate these and other related concepts.

Children could be encouraged to revisit rounding to estimate and approximate as a way of sense-checking their answers.

Things to look out for

- Children may mix up the different effects on additions and subtractions if one or more of the numbers is adjusted.
- Children may try to find the missing number by performing a long series of calculations instead of looking at the relationships between the numbers in the given calculations.

Key questions

- What is the same and what is different about the numbers in the two calculations?
- If the two additions/subtractions have the same result, what does that tell you about the numbers in the additions/subtractions?
- If you increase/decrease the first number by _____, what do you need to do to the second number for the total/difference to stay the same?

Possible sentence stems

- _____ has been added/subtracted to/from the first number, so _____ must be _____ to/from the second number to keep the total the same.
- _____ has been added/subtracted to/from the first number, so _____ must be _____ to/from the second number to keep difference the same.

National Curriculum links

- Add and subtract numbers mentally with increasingly large numbers
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Find missing numbers

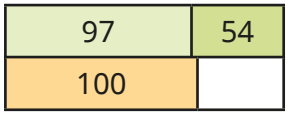
Key learning

- Complete the calculations.
  - _____ – 100 = 5,823
  - _____ – 1,000 = 5,823
  - 5,423 + _____ = 5,823
  - 3,623 + _____ = 5,823

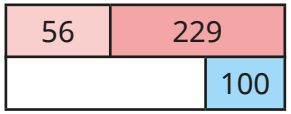
- Complete the calculations.

  Use the bar models to help you.

  97 + 54 = 100 + _____



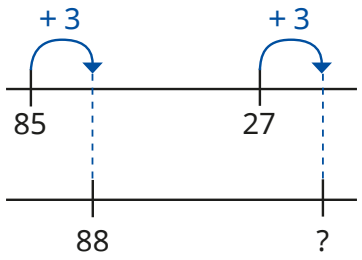
  56 + 229 = _____ + 100



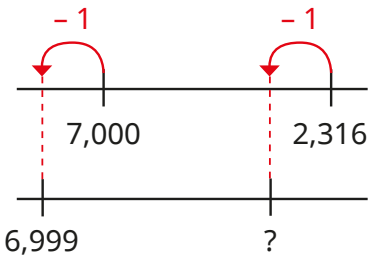
- Complete the calculations.

  Use the number lines to help you.

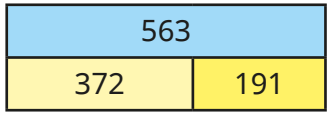
  85 – 27 = 88 – _____

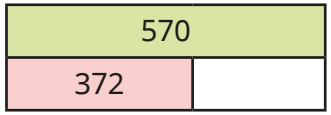


  7,000 – 2,316 = 6,999 – _____



- Use the first bar model to work out the missing number in the second bar model.





- Complete the calculations.
  - 536 + 275 = 540 + _____
  - 536 – 275 = 540 – _____
  - 3,000 – 513 = 2,999 – _____
  - 2,685 + _____ = 2,695 + 3,541

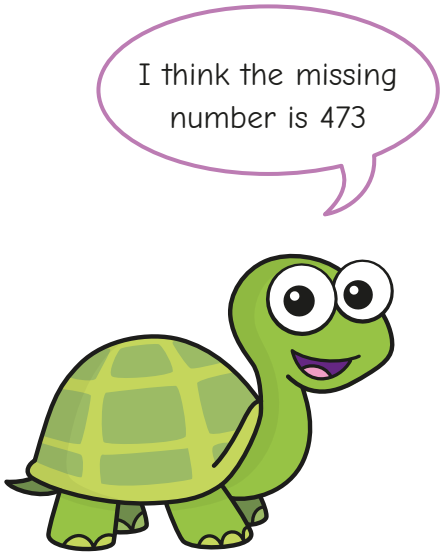
- Match the calculations that have the same results.

623 + 418	849 – 332
725 + 517	621 + 420
847 – 329	848 – 330
846 – 329	520 + 722

Find missing numbers

Reasoning and problem solving

$327 + \square < 700$



Explain the mistake Tiny has made.

Tiny has found the bond to 700 and ignored the inequality symbol.

$48 + 37 > 38 + \triangle$

Give an example of what $\triangle$ **could** be.

any number less than 47

Give an example of what $\triangle$ **could not** be.

any number greater than or equal to 47

What **must** be true about $\triangle$?

It must be less than 47

Write the missing digits to make the calculations correct.

$\_3\_ + \_3 = 300$

$\_3\_ - \_3 = 300$

How many possible solutions are there for each of the calculations?

237 + 63 = 300

333 – 33 = 300

Both calculations have only one possible solution.