Autumn

Scheme of learning

Year 4

White Rose Maths

#MathsEveryoneCan

The **White Rose Maths** schemes of learning

Teaching for mastery

Our research-based schemes of learning are designed to support a mastery approach to teaching and learning and are consistent with the aims and objectives of the National Curriculum.

Putting number first

Our schemes have number at their heart.
A significant amount of time is spent reinforcing number in order to build competency and ensure children can confidently access the rest of the curriculum.

Depth before breadth

Our easy-to-follow schemes support teachers to stay within the required key stage so that children acquire depth of knowledge in each topic. Opportunities to revisit previously learned skills are built into later blocks.

Working together

Children can progress through the schemes as a whole group, encouraging students of all abilities to support each other in their learning.

Fluency, reasoning and problem solving

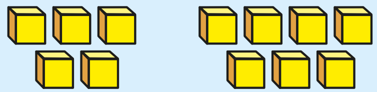
Our schemes develop all three key areas of the National Curriculum, giving children the knowledge and skills they need to become confident mathematicians.

Concrete – Pictorial – Abstract (CPA)

Research shows that all children, when introduced to a new concept, should have the opportunity to build competency by following the CPA approach. This features throughout our schemes of learning.

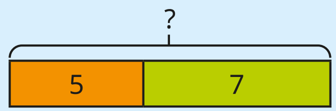
Concrete

Children should have the opportunity to work with physical objects/concrete resources, in order to bring the maths to life and to build understanding of what they are doing.



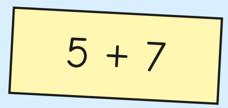
Pictorial

Alongside concrete resources, children should work with pictorial representations, making links to the concrete.
Visualising a problem in this way can help children to reason and to solve problems.



Abstract

With the support of both the concrete and pictorial representations, children can develop their understanding of abstract methods.

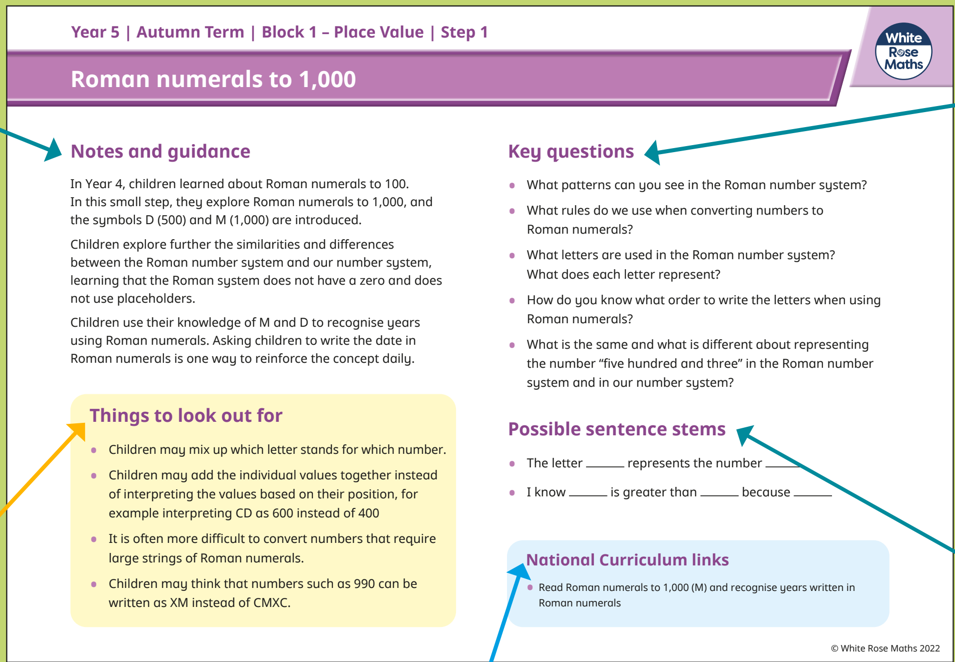


If you have questions about this approach and would like to consider appropriate CPD, please visit www.whiterosemaths.com to find a course that's right for you.

Teacher guidance

Every block in our schemes of learning is broken down into manageable small steps, and we provide comprehensive teacher guidance for each one. Here are the features included in each step.

Notes and guidance that provide an overview of the content of the step and ideas for teaching, along with advice on progression and where a topic fits within the curriculum.


Year 5 | Autumn Term | Block 1 – Place Value | Step 1

Roman numerals to 1,000

Notes and guidance

In Year 4, children learned about Roman numerals to 100. In this small step, they explore Roman numerals to 1,000, and the symbols D (500) and M (1,000) are introduced.

Children explore further the similarities and differences between the Roman number system and our number system, learning that the Roman system does not have a zero and does not use placeholders.

Children use their knowledge of M and D to recognise years using Roman numerals. Asking children to write the date in Roman numerals is one way to reinforce the concept daily.

Things to look out for

- Children may mix up which letter stands for which number.
- Children may add the individual values together instead of interpreting the values based on their position, for example interpreting CD as 600 instead of 400
- It is often more difficult to convert numbers that require large strings of Roman numerals.
- Children may think that numbers such as 990 can be written as XM instead of CMXC.

Key questions

- What patterns can you see in the Roman number system?
- What rules do we use when converting numbers to Roman numerals?
- What letters are used in the Roman number system? What does each letter represent?
- How do you know what order to write the letters when using Roman numerals?
- What is the same and what is different about representing the number "five hundred and three" in the Roman number system and in our number system?

Possible sentence stems

- The letter ___ represents the number ___
- I know ___ is greater than ___ because ___

National Curriculum links

- Read Roman numerals to 1,000 (M) and recognise years written in Roman numerals

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Key questions that can be posed to children to develop their mathematical vocabulary and reasoning skills, digging deeper into the content.

Things to look out for, which highlights common mistakes, misconceptions and areas that may require additional support.

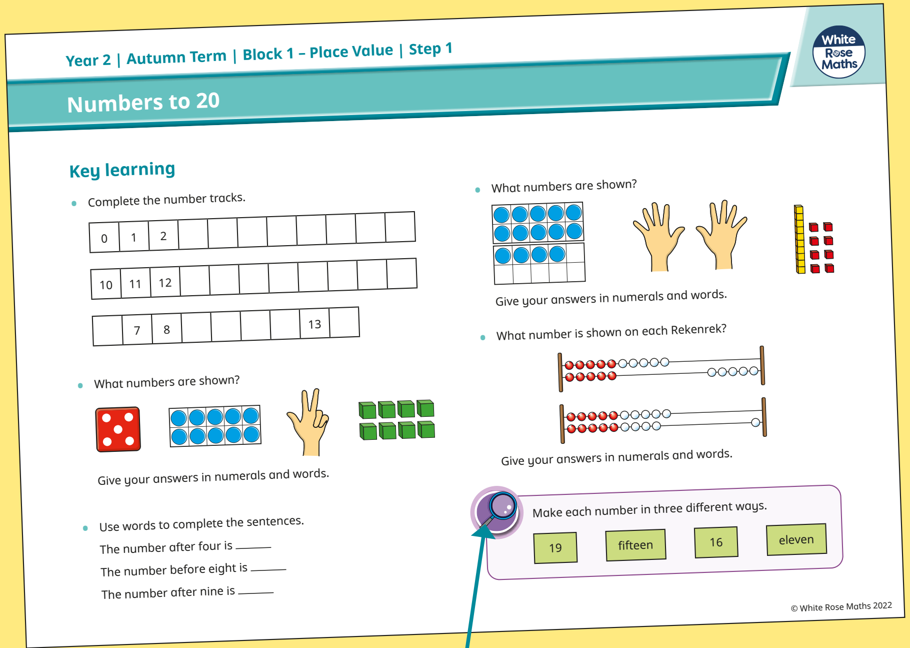
Possible sentence stems to further support children's mathematical language and to develop their reasoning skills.

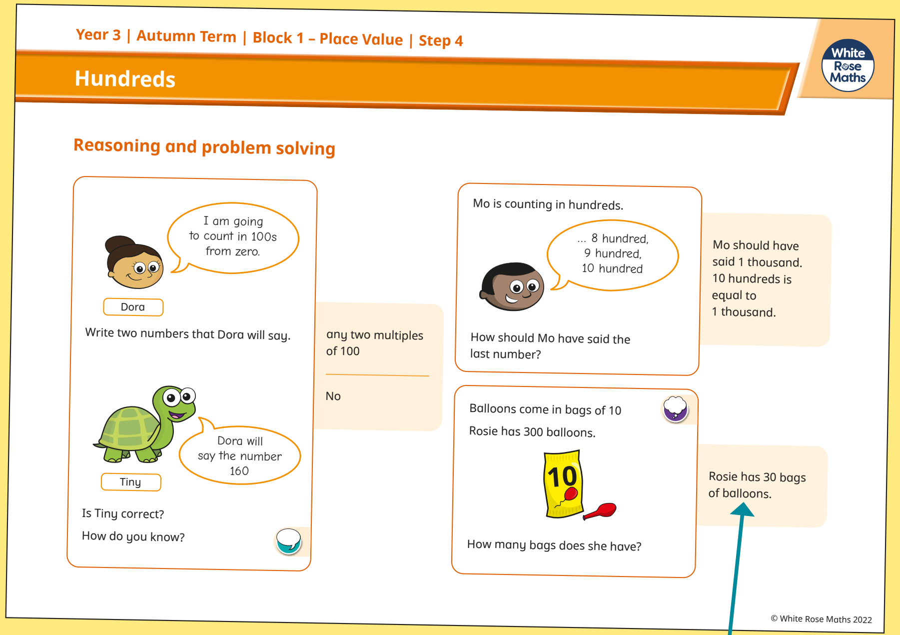
National Curriculum links to indicate the objective(s) being addressed by the step.

Teacher guidance

A **Key learning** section, which provides plenty of exemplar questions that can be used when teaching the topic.

Reasoning and problem-solving activities and questions that can be used in class to provide further challenge and to encourage deeper understanding of each topic.





Activity symbols that indicate an idea can be explored practically

Answers provided where appropriate

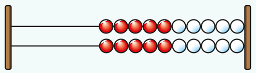
Activities and symbols

Key Stage 1 activities

Key Stage 1 includes more hands-on activities alongside questions.

An activity to be led by the teacher

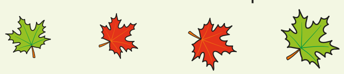
Use a Rekenrek in the ready position.



Ask children to show a number on their Rekenrek.

An outside activity or one that uses resources from nature

Find some seeds and leaves to represent Autumn.



Ask children to sort the objects in three different ways and then compare their answers with a partner.

An activity introduced by a reading from an appropriate fiction or non-fiction book

Read *The Button Box* by M Reid.

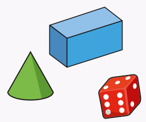
Give children a selection of buttons and ask them to sort the buttons in as many different ways as they can.

Encourage them to think about size, shape, colour and number of holes.

An investigation

Give children a selection of 3D shapes.

Ask children to sort the objects into two groups and then challenge a partner to say how the objects have been sorted.



Key Stage 1 and 2 symbols

The following symbols are used to indicate:

- concrete resources might be useful to help answer the question
- a bar model might be useful to help answer the question
- drawing a picture might help children to answer the question
- children talk about and compare their answers and reasoning
- a question that should really make children think. The question may be structured differently or require a different approach from others and/or tease out common misconceptions.

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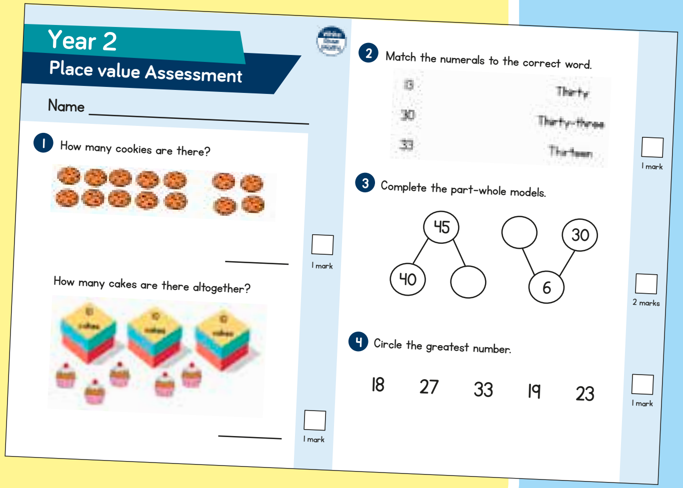
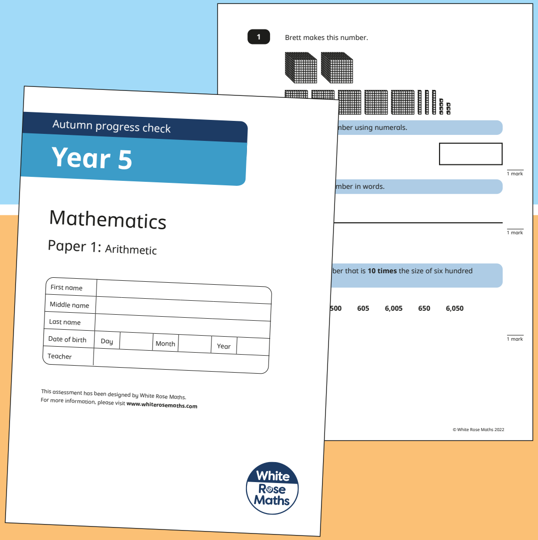
Free supporting materials

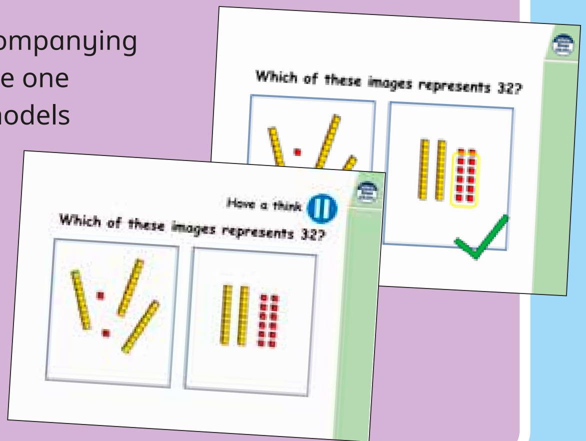
End-of-block assessments to check progress and identify gaps in knowledge and understanding.



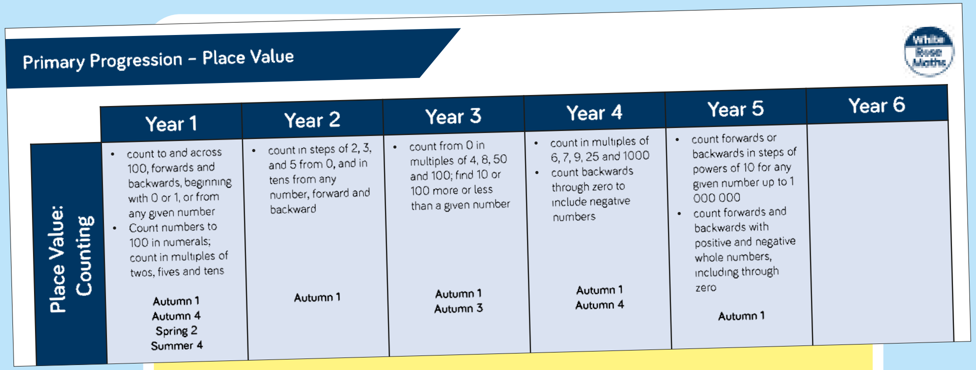


End-of-term assessments for a more summative view of where children are succeeding and where they may need more support.

Each small step has an accompanying **home learning video** where one of our team of specialists models the learning in the step. These can also be used to support students who are absent or who need to catch up content from earlier blocks or years.



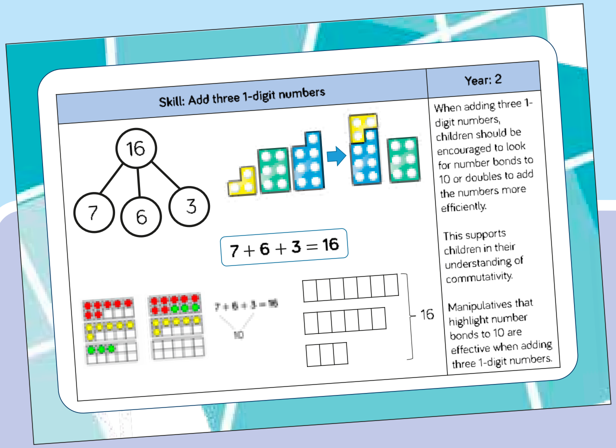
Free supporting materials



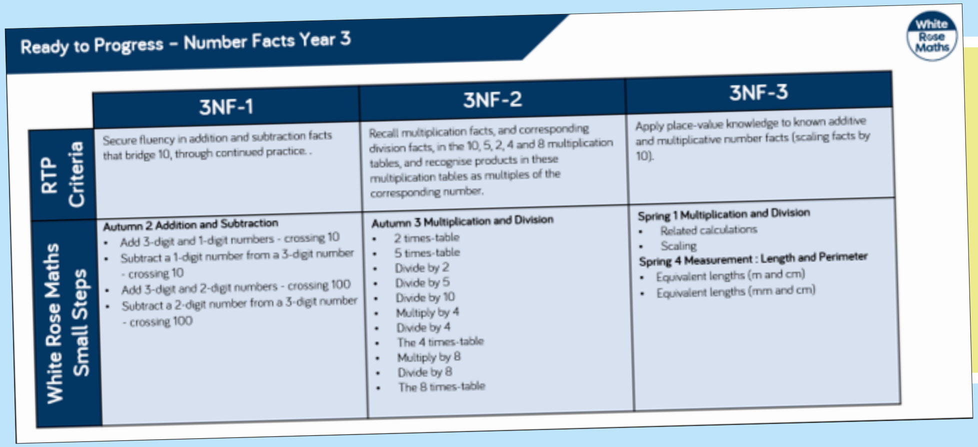
Primary Progression – Place Value

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Place Value: Counting	• count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number • Count numbers to 100 in numerals; count in multiples of twos, fives and tens Autumn 1 Autumn 4 Spring 2 Summer 4	• count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward Autumn 1	• count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number Autumn 1 Autumn 3	• count in multiples of 6, 7, 9, 25 and 1000 • count backwards through zero to include negative numbers Autumn 1 Autumn 4	• count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 • count forwards and backwards with positive and negative whole numbers, including through zero Autumn 1	

National Curriculum progression to indicate how the schemes of learning fit into the wider picture and how learning progresses within and between year groups.



Calculation policies that show how key approaches develop from Year 1 to Year 6.



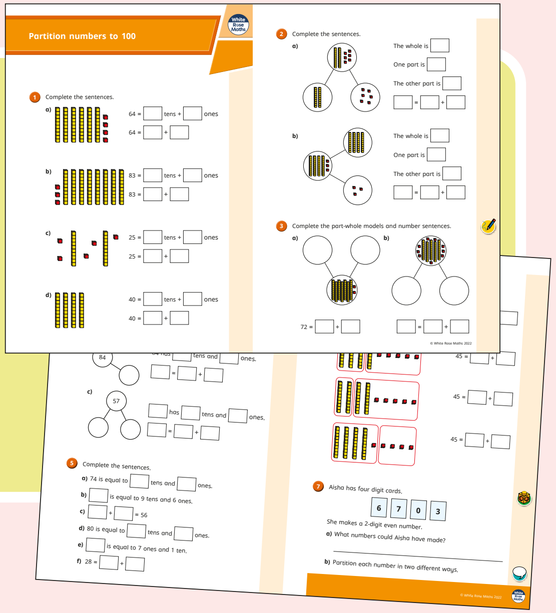
Ready to Progress – Number Facts Year 3

	3NF-1	3NF-2	3NF-3
RTP Criteria	Secure fluency in addition and subtraction facts that bridge 10, through continued practice.	Recall multiplication facts, and corresponding division facts, in the 10, 5, 2, 4 and 8 multiplication tables, and recognise products in these multiplication tables as multiples of the corresponding number.	Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 10).
White Rose Maths Small Steps	**Autumn 2 Addition and Subtraction** • Add 3-digit and 1-digit numbers - crossing 10 • Subtract a 1-digit number from a 3-digit number - crossing 10 • Add 3-digit and 2-digit numbers - crossing 100 • Subtract a 2-digit number from a 3-digit number - crossing 100	**Autumn 3 Multiplication and Division** • 2 times-table • 5 times-table • Divide by 2 • Divide by 5 • Divide by 10 • Multiply by 4 • Divide by 4 • The 4 times-table • Multiply by 8 • Divide by 8 • The 8 times-table	**Spring 1 Multiplication and Division** • Related calculations • Scaling **Spring 4 Measurement : Length and Perimeter** • Equivalent lengths (m and cm) • Equivalent lengths (mm and cm)

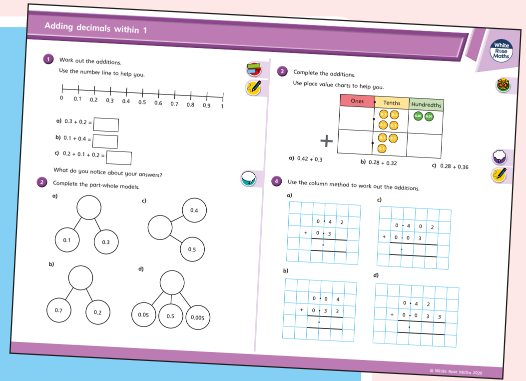
Ready to progress mapping that shows how the schemes of learning link to curriculum prioritisation.

Premium supporting materials

Worksheets to accompany every small step, providing relevant practice questions for each topic that will reinforce learning at every stage.

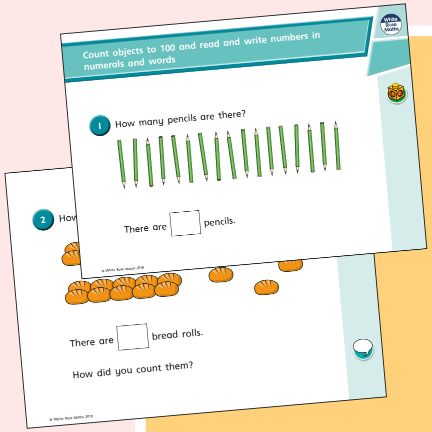


Display versions of the worksheet questions for front of class/whole class teaching.

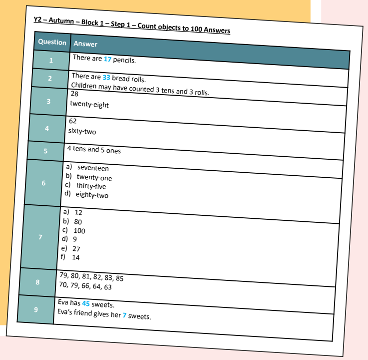


Also available as printed **workbooks**, per block.

PowerPoint™ versions of the worksheet questions to incorporate them into lesson planning.

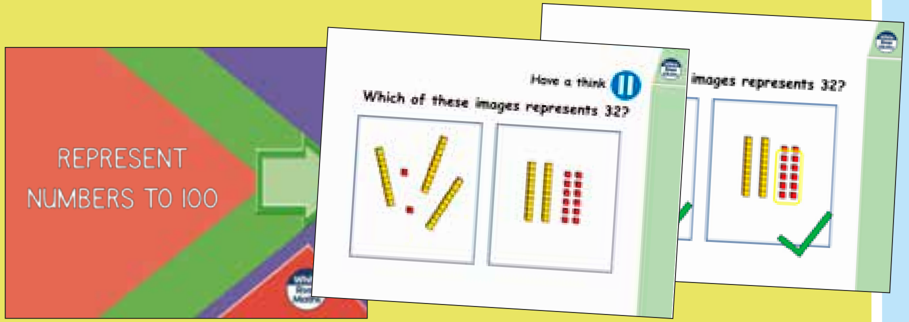


Answers to all the worksheet questions.

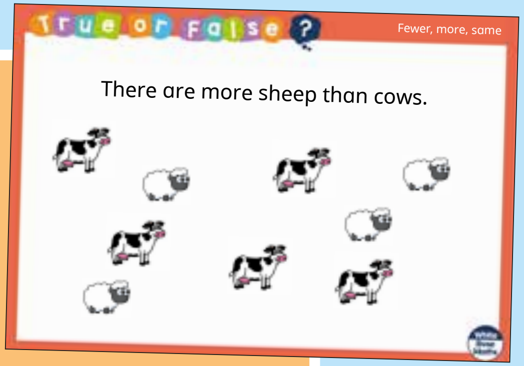


Premium supporting materials

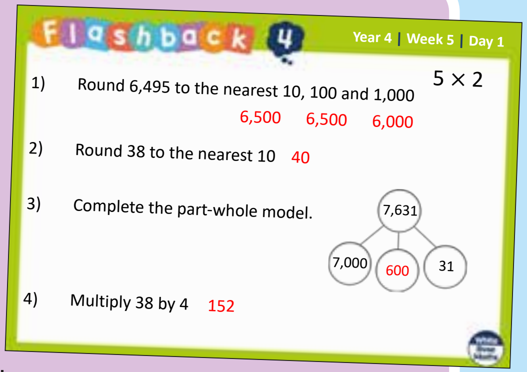
Teaching slides that mirror the content of our home learning videos for each step. These are fully animated and editable, so can be adapted to the needs of any class.



A **true or false** question for every small step in the scheme of learning. These can be used to support new learning or as another tool for revisiting knowledge at a later date.



Flashback 4 starter activities to improve retention.
Q1 is from the last lesson;
Q2 is from last week;
Q3 is from 2 to 3 weeks ago;
Q4 is from last term/year.
There is also a bonus question on each one to recap topics such as telling the time, times-tables and Roman numerals.



Topic-based CPD videos
As part of our on-demand CPD package, our maths specialists provide helpful hints and guidance on teaching topics for every block in our schemes of learning.

Meet the characters

Our class of characters bring the schemes to life, and will be sure to engage learners of all ages and abilities. Follow the children and their class pet, Tiny the tortoise, as they explore new mathematical concepts and ideas.

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Yearly overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number **Place value**				Number **Addition and subtraction**			Measurement **Area**	Number **Multiplication and division A**			**Consolidation**
Spring	Number **Multiplication and division B**			Measurement **Length and perimeter**		Number **Fractions**				Number **Decimals A**		
Summer	Number **Decimals B**		Measurement **Money**		Measurement **Time**		**Consolidation**	Geometry **Shape**		**Statistics**	Geometry **Position and direction**	

Autumn Block 1

Place value

Small steps

Step 1	Represent numbers to 1,000
Step 2	Partition numbers to 1,000
Step 3	Number line to 1,000
Step 4	Thousands
Step 5	Represent numbers to 10,000
Step 6	Partition numbers to 10,000
Step 7	Flexible partitioning of numbers to 10,000
Step 8	Find 1, 10, 100, 1,000 more or less

Small steps

Step 9	Number line to 10,000
Step 10	Estimate on a number line to 10,000
Step 11	Compare numbers to 10,000
Step 12	Order numbers to 10,000
Step 13	Roman numerals
Step 14	Round to the nearest 10
Step 15	Round to the nearest 100
Step 16	Round to the nearest 1,000

Small steps

Step 17	Round to the nearest 10, 100 or 1,000

Represent numbers to 1,000

Notes and guidance

Children learned how to represent numbers to 1,000 in Year 3 – a concept that will be reinforced in this small step to ensure they have a sound understanding. This understanding will be important later in the block, as children begin to explore numbers over 1,000

Examples have been chosen to ensure that children look at representing and interpreting numbers that have no tens or no ones, to reinforce the idea of using zero as a placeholder. Base 10 and place value counters are used throughout. Base 10 can help children understand the size of a number, while place value counters are more efficient later in the block, when working with 4-digit numbers.

Things to look out for

- Children may write numbers incorrectly, for example 421 as 400201
- Children may not understand the place value of each digit in a number.
- Children may not use placeholders appropriately.
- Children may not recognise the value of a place value counter correctly, because different place value counters are identical in size.

Key questions

- What is the value of each base 10 piece?
- What is the value of each place value counter?
- How did you count the pieces?
- Does the order in which you build the number matter?
- Can you represent the number another way?
- What do you do if there are no tens?

Possible sentence stems

- There are ______ hundreds, ______ tens and ______ ones.
  The number is ______
- When a number has no ______, then we use ______ as a placeholder.

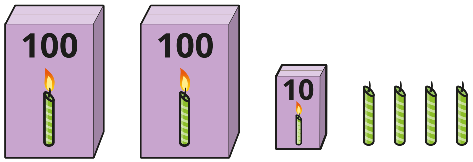
National Curriculum links

- Read and write numbers up to 1,000 in numerals and words (Y3)
- Identify, represent and estimate numbers using different representations

Represent numbers to 1,000

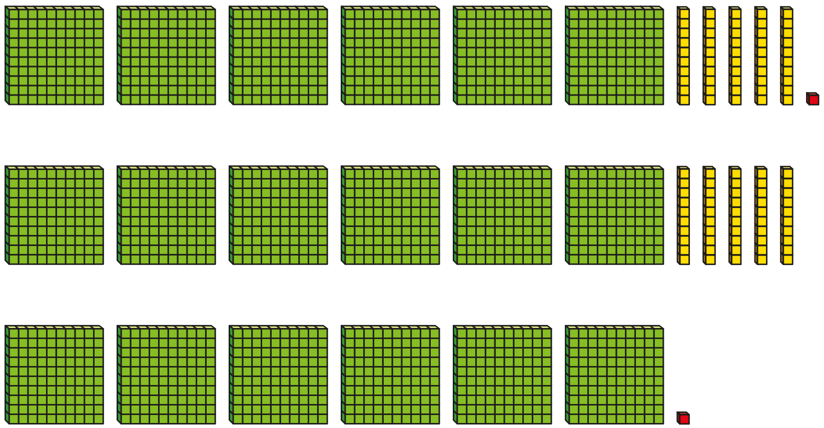
Key learning

- How many candles are there?



Write your answer in numerals and words.

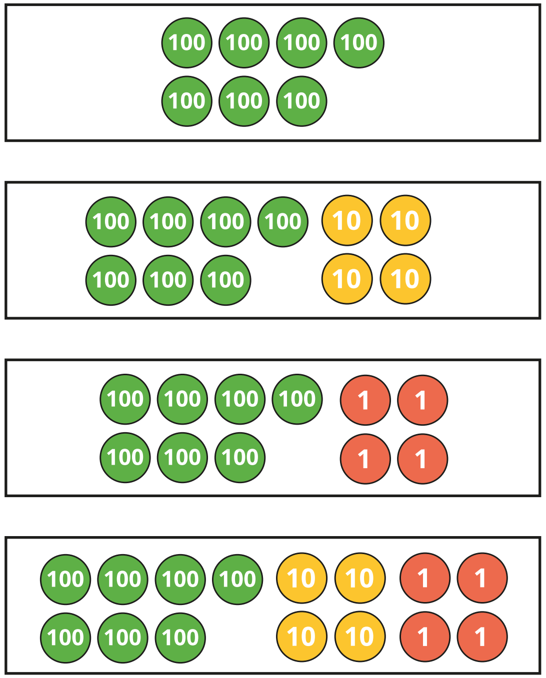
- What numbers are represented?



- Use base 10 to represent each number.

362	326	306	360	300	230

- What numbers are represented?



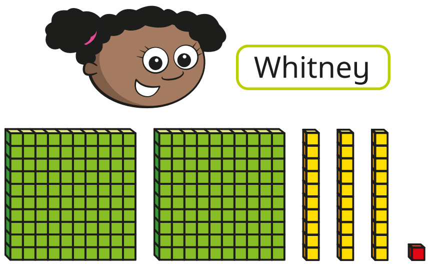
- Annie is drawing place value counters to represent 516

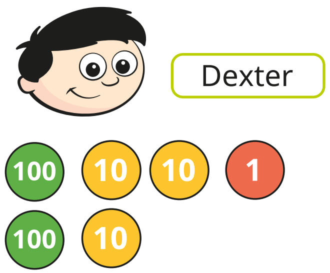
Complete her drawing.

Represent numbers to 1,000

Reasoning and problem solving

Whitney and Dexter have each made a number.

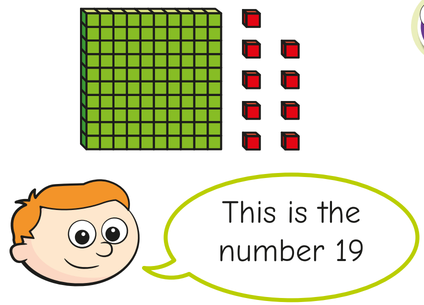




What numbers have they made?

What is the same about their numbers?
What is different?

Whitney and Dexter have both made the number 231

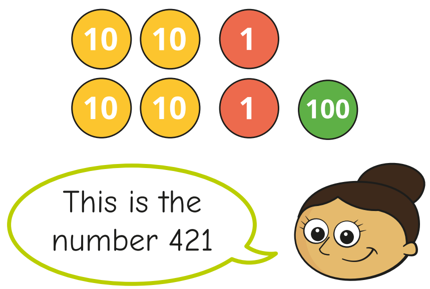


What mistake has Ron made?

What is the number?

Ron has mistaken 100 for 10, and not used placeholders correctly.

109



What mistake has Dora made?

What is the number?

Dora has not used the place value of each counter correctly.

142

Partition numbers to 1,000

Notes and guidance

In this small step, children partition numbers up to 1,000 into hundreds, tens and ones.

Children represent numbers in a part-whole model and identify missing parts and wholes. They write numbers in expanded form, using the part-whole model as support where needed, and identify the number of hundreds, tens and ones in a 3-digit number. Particular attention should be paid to numbers that include zero as a placeholder, to build on learning from the previous step.

Base 10 and place value counters can continue to be used to support children's understanding.

Things to look out for

- Children may not correctly assign place value to each digit of a number. For example, they may write 423 = 4 + 2 + 3
- Children may not recognise a number represented by a part-whole model, where the parts are not given in value order.
- Children may say that 423 has 20 tens rather than 2 tens, because they confuse place value language.

Key questions

- How many hundreds/tens/ones are there in 465?
- How do you write a number that has zero tens?
- How do you write a number that has zero ones?
- What number is equal to 300 + 70 + 9?
- What is the value of the missing part? How do you know?
- What is the value of the digit ______ in the number ______?

Possible sentence stems

- ______ has ______ hundreds, ______ tens and ______ ones.

  ______ = ______ + ______ + ______
- The number that is made up of ______ hundreds, ______ tens and ______ ones is ______

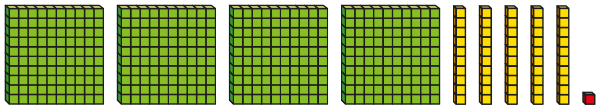
National Curriculum links

- Identify, represent and estimate numbers using different representations
- Recognise the place value of each digit in a 3-digit number (hundreds, tens, ones) (Y3)

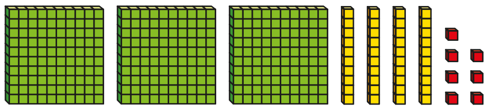
Partition numbers to 1,000

Key learning

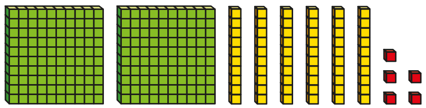
- Use the base 10 to help you complete the number sentences.



451 = 400 + ______ + ______



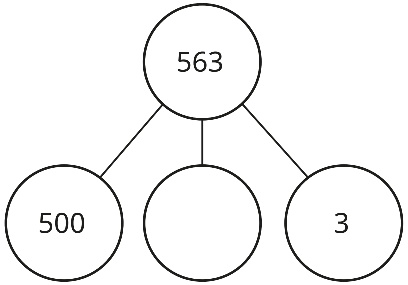
347 = ______ + ______ + ______

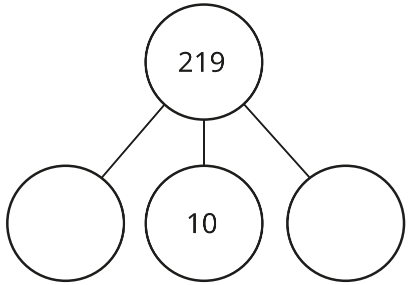


265 = ______ + ______ + ______

- Complete the number sentences.
  - 982 = ______ + ______ + ______
  - 980 = ______ + ______
  - 902 = ______ + ______

- Complete the part-whole models.





- Complete the sentences.
  - 259 has ______ hundreds, ______ tens and ______ ones.
  - 813 has 8 ______, 1 ______ and 3 ______
  - 106 has ______ hundred, ______ tens and ______ ones.
  - ______ has 5 hundreds, 1 ten and 0 ones.

- How many hundreds does the number 907 have?

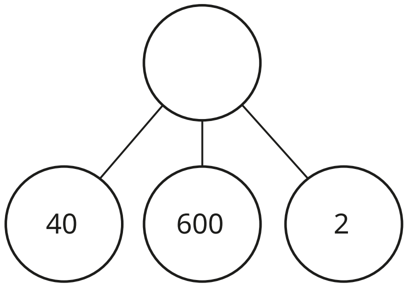
  How many ones does the number 36 have?

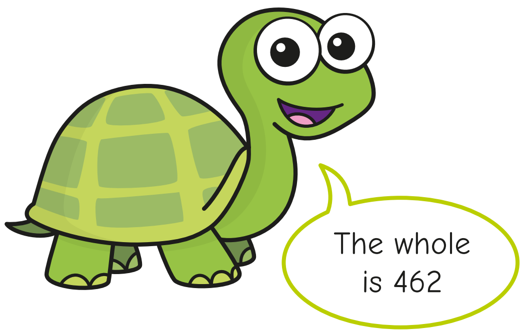
  How many tens does the number 680 have?

- Write in numerals the number that has 7 hundreds, 1 one and 2 tens.

Partition numbers to 1,000

Reasoning and problem solving





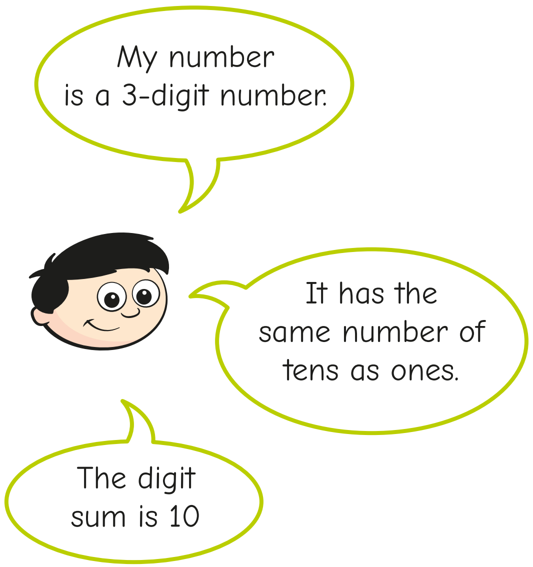
Explain the mistake that Tiny has made.

What is the whole?

Tiny has not recognised that the parts are not in order.

642

Dexter is thinking of a number.



What could Dexter's number be?

Find each possibility and partition it.

244 = 200 + 40 + 4

433 = 400 + 30 + 3

622 = 600 + 20 + 2

811 = 800 + 10 + 1

Number line to 1,000

Notes and guidance

In this small step, children revisit the number line to 1,000, which they were first introduced to in Year 3

Children label, identify and find missing values on blank or partially completed number lines. Using real-life scales, such as rulers and measuring jugs, can be helpful here.

When looking at partially completed number lines, it is important that children become confident in finding the difference between the start and end points and dividing to find the value of each interval. Explicit examples should be used that have a varying number of intervals and unmarked values in different positions.

Children also learn how to work out the value at the midpoint of an interval.

Things to look out for

- Children may count the number of divisions, rather than the intervals.
- Support may be needed to work out the midpoint of an interval.
- Children may assume the increments on the number line are each worth one unit, focusing solely on the starting number.

Key questions

- What are the values at the start and end points of the number line?
- What is the difference in value between the start and end points?
- How many intervals are there?
- How can you work out what each interval is worth?
- How can you work out the halfway point of an interval?
- What other numbers can you mark on the number line?
- Why are the start and end values of a number line important?

Possible sentence stems

- The difference in value between the start and end of the number line is ______
- There are ______ intervals. Each interval is worth ______

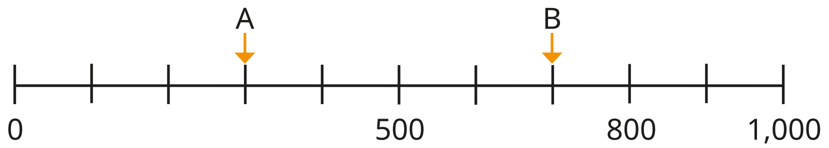
National Curriculum links

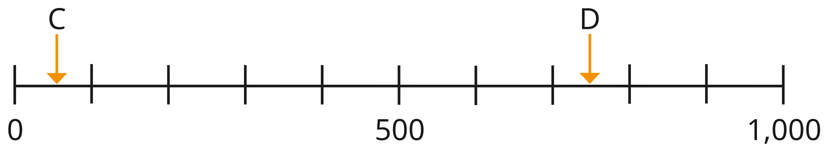
- Identify, represent and estimate numbers using different representations

Number line to 1,000

Key learning

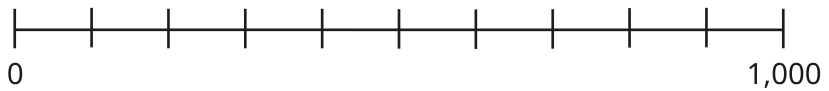
- What numbers are the arrows pointing to?





- Complete the sentences for each number line.

  Label the number lines.

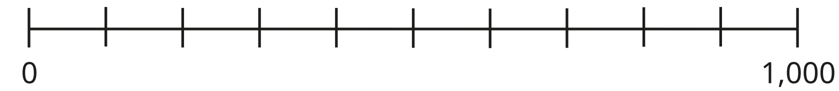


The difference in value between the start and the end of the number line is ______

There are ______ intervals.

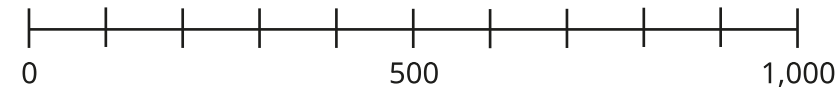
______ ÷ ______ = ______

- Label 200 and 750 on the number line.



- Label 680 on the number line.

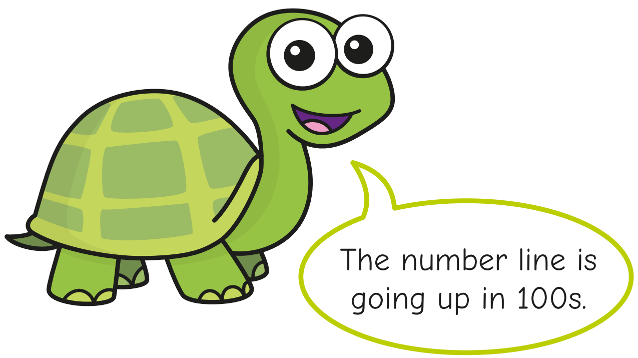
- Draw an arrow to show the position of 550 on each number line.

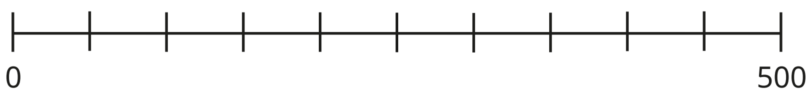


What do you notice?

Number line to 1,000

Reasoning and problem solving



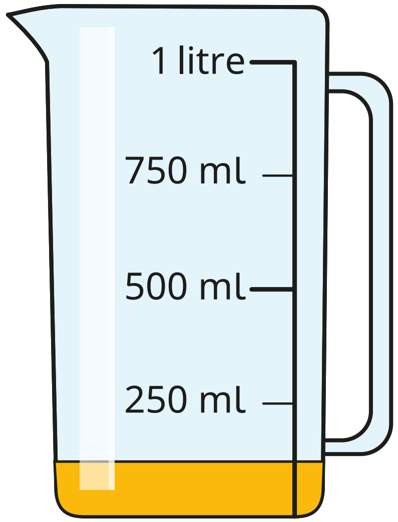


Do you agree with Tiny?

Talk about your answer with a partner.

No

Filip has poured some juice from a jug.



Estimate how much juice is left in the jug.

approximately 125 ml

Thousands

Notes and guidance

Building on previous steps where children explored numbers up to 1,000, they now explore numbers beyond 1,000

The initial focus of this small step is counting in 1,000s forwards and backwards from any given multiple of 1,000. Number tracks can be used to support this.

Children then look at the composition of multiples of 1,000 by exploring how many hundreds they are made of. They unitise the hundred, being able to state the number of hundreds that make up any 4-digit multiple of 100 or 1,000 such as "20 hundreds are equal to 2,000"

Base 10 and place value counters in a ten frame are helpful when identifying the connection between the number of hundreds that are equal to a multiple of a thousand.

Things to look out for

- Children may not appreciate that 1,000 is 10 times the size of 100
- When they are meant to be counting in 1,000s, children may count in the more familiar 100s.
- Children may not use placeholders appropriately.

Key questions

- Counting in 1,000s from 3,000, what is the next number?
- Counting back in 1,000s from 7,000, tell me a number you would say. How do you know?
- How many thousands are there in 6,000?
- How many hundreds are there in 1,000?
- How many hundreds are there in 6,000?

Possible sentence stems

- The next multiple of 1,000 is ______
- The previous multiple of 1,000 is ______
- 1 thousand is equal to ______ hundreds, so ______ thousands is equal to ______ hundreds.
- ______ thousands can be written in numerals as ______

National Curriculum links

- Count in multiples of 6, 7, 9, 25 and 1,000

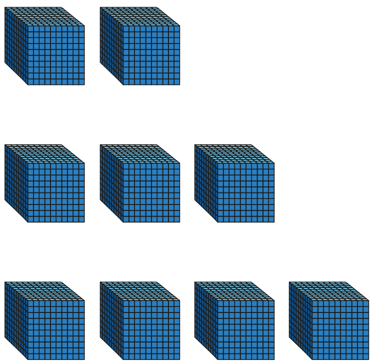
Thousands

Key learning

- How many nails are there?

Write your answer in numerals and words.

- What numbers are represented?

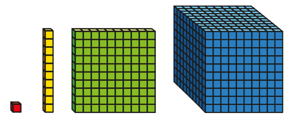


- Complete the number tracks.

1,000	2,000			

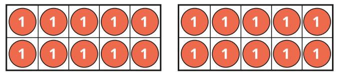
		7,000	8,000	9,000

- Complete the sentences.

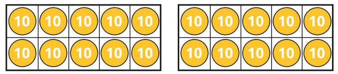


  - There are ______ ones in a thousand.
  - There are ______ hundreds in a thousand.
  - There are ______ tens in a thousand.

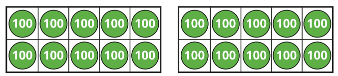
- Complete the sentences to match the ten frames.



______ ones = ______ tens



______ tens = ______ hundreds



______ hundreds = ______ thousands

- Complete the sentences.
  - 3 thousand = 3,000

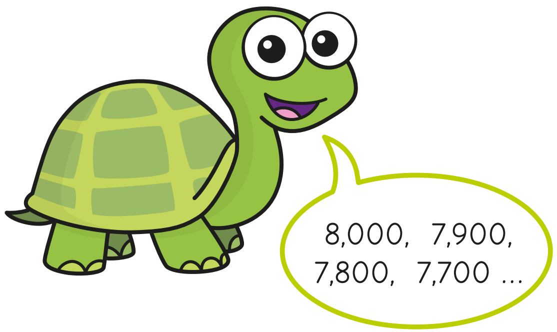
    There are ______ hundreds in 3 thousand.
  - ______ thousand = 5,000

    There are 50 hundreds in ______ thousand.

Thousands

Reasoning and problem solving

Tiny is counting back in 1,000s from 8,000



What mistake has Tiny made?

Tiny has counted back in 100s, not 1,000s.

Tiny should say, “8,000, 7,000, 6,000 …”

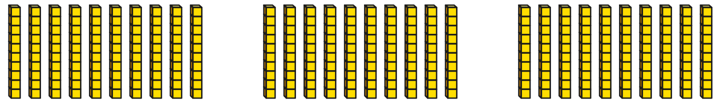
Is the statement true or false?

When counting in 1,000s, the numbers will always have four digits.

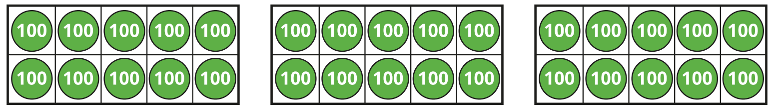
False

Jack, Huan and Dani are asked to represent 3,000

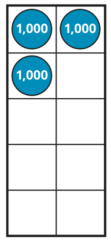
Jack



Huan



Dani



Who do you agree with?

Explain your answer.

Huan and Dani

Represent numbers to 10,000

Notes and guidance

Building on earlier work, where children looked at numbers to 1,000, this small step focuses on representing numbers to 10,000

Children use different representations such as place value charts and Gattegno charts, which highlight the place value of the digits in the numbers. It is important that children explore the relationship "both ways" between the place value columns, for example, 100 is 10 times the size of 10 and a tenth the size of 1,000

It may be helpful to discuss with children how and why we use a comma when writing numbers, as it can help with reading and writing larger numbers.

Children should experience questions that include zero as a placeholder to represent a blank column in a place value chart.

Things to look out for

- Numbers may be written incorrectly, for example 2,342 as 2000300402
- When using blank counters on a place value chart, children may not make the connection between the column and the value of the counter.
- Children may forget to use zero as a placeholder.

Key questions

- What number is represented?
- What is the value of each digit?
- Represent 4,672 using base 10/place value counters. How many thousands, hundreds, tens and ones are in the number?
- How would you represent 6,000 + 0 + 60 + 9 in the place value chart?
- How do you know the counter in the thousands column has a greater value than the counter in the ones column?

Possible sentence stems

- There are ______ thousands, ______ hundreds, ______ tens and ______ ones.

  The number is ______

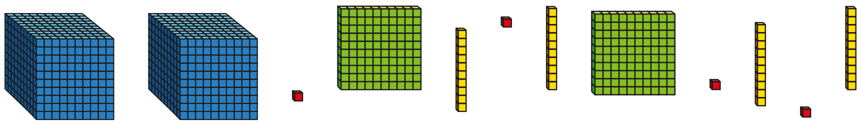
National Curriculum links

- Recognise the place value of each digit in a 4-digit number (thousands, hundreds, tens and ones)
- Identify, represent and estimate numbers using different representations

Represent numbers to 10,000

Key learning

- Complete the sentences.



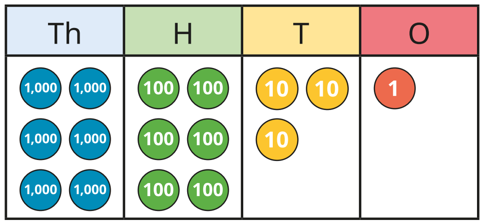
There are ______ thousands, ______ hundreds, ______ tens and ______ ones.

The number is ______

- Use base 10 to represent each number.

1,222   1,871   3,468   2,107

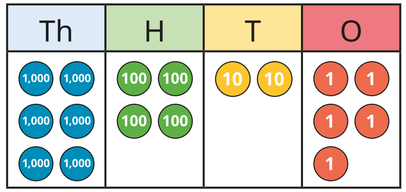
- Complete the sentences.

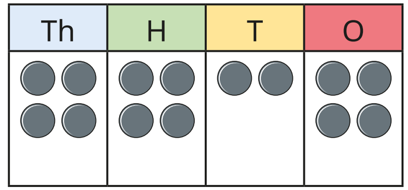


There are ______ thousands, ______ hundreds, ______ tens and ______ ones.

The number is ______

- What numbers are represented on the place value charts?





Write your answers in words and numerals.

What is the same and what is different about the place value charts?

- Use plain counters to represent each number on a place value chart.

4,012   5,540   6,207   8,001

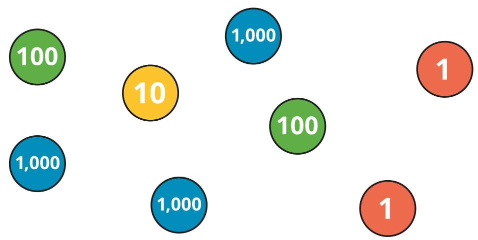
- Complete the Gattegno chart to represent the number 5,326

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
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

Represent numbers to 10,000

Reasoning and problem solving

Aisha is making 3,512 with place value counters.



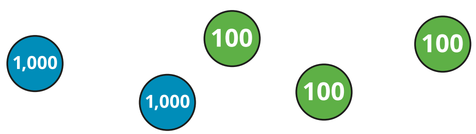
What other place value counters could she add to make 3,512?

multiple possible answers, e.g.
3 hundreds

2 hundreds and 10 tens

300 ones

Jack has two 1,000 counters and three 100 counters.

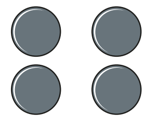


What 4-digit numbers can he make?

2,300, 2,200, 2,100, 2,000, 1,300, 1,200, 1,100, 1,000

Use exactly four counters to make as many 4-digit numbers as possible.

Write each number in numerals.



Th	H	T	O

4,000, 3,100, 3,010, 3,001, 2,200, 2,020, 2,002, 2,110, 2,101, 2,011, 1,300, 1,030, 1,003, 1,210, 1,201, 1,120, 1,102, 1,111

Partition numbers to 10,000

Notes and guidance

The focus of this small step is to ensure that children have a secure understanding of place value with 4-digit numbers.

Children partition a number up to 10,000 by identifying the number of thousands, hundreds, tens and ones. They should give their answers using numerals, words and expanded form, for example 5,346 = 5 thousands, 3 hundreds, 4 tens and 6 ones or 5,000 + 300 + 40 + 6

The familiar representations used earlier in the block can help children to understand the value of each digit. A part-whole model can also support children in partitioning numbers.

Children should experience questions that include zero as a placeholder, so they understand this cannot be omitted, minimising the misconception that 5,006 = 56

Things to look out for

- Children may not associate the digits with their value and just write, for example, 7,645 = 7 + 6 + 4 + 5
- Partitioned numbers that are presented "out of order" may lead to errors, for example 7,000 + 3 + 20 + 700 = 7,327
- Children may omit zero as a placeholder.

Key questions

- What number is represented?
- How many thousands/hundreds/tens/ones are there in the number ______?
- What is the value of each digit in 4,715?
- Does the order in which you partition the number matter?
- What number is equal to 7,000 + 0 + 30 + 4?
- What does a zero in a place value column tell you?

Possible sentence stems

- ______ has ______ thousands, ______ hundreds, ______ tens and ______ ones.

  ______ = ______ + ______ + ______ + ______

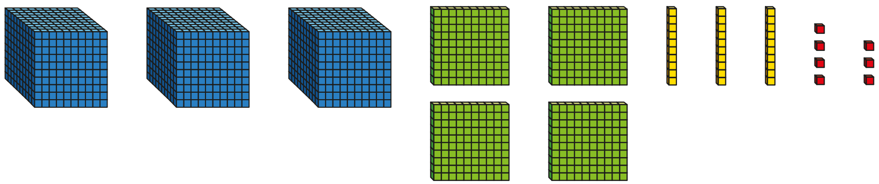
National Curriculum links

- Recognise the place value of each digit in a 4-digit number (thousands, hundreds, tens and ones)
- Identify, represent and estimate numbers using different representations

Partition numbers to 10,000

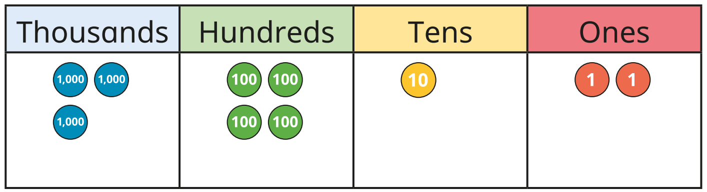
Key learning

- Complete the number sentence.

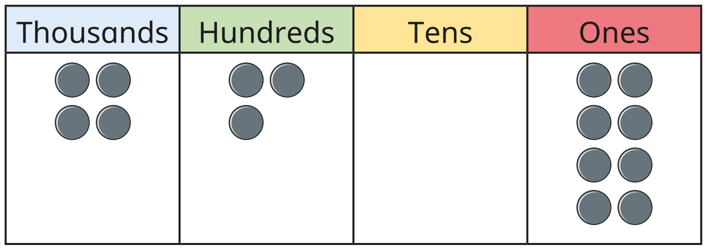


3,437 = 3,000 + ______ + ______ + ______

- Complete the number sentences.



3,412 = ______ + ______ + ______ + ______



______ = ______ + ______ + ______ + ______

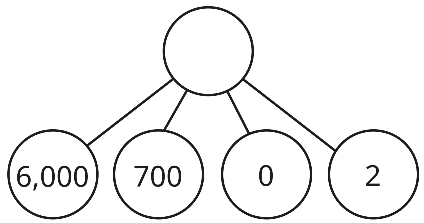
- Use the Gattegno chart to complete the number sentences.

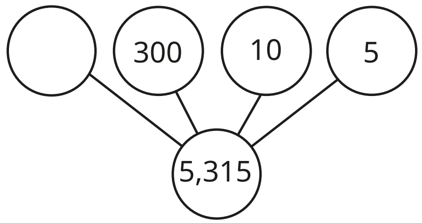
1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

There are ______ thousands, ______ hundreds, ______ tens and ______ ones.

The number is ______

- Complete the part-whole models.

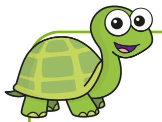




- Complete the sentences.
  - 7,812 is equal to ______ thousands, ______ hundreds, ______ tens and ______ ones.
  - ______ is equal to 3 thousands, 4 hundreds, 0 tens and 9 ones.
  - ______ = 8,000 + 40 + 3

Partition numbers to 10,000

Reasoning and problem solving



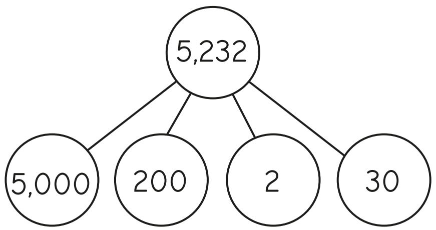
Tiny is partitioning 6,902

6,902 = 600 + 90 + 2

Explain the mistake Tiny has made.

Tiny has not assigned the correct value to each digit because there are no tens.

Tiny is partitioning the number 5,232 and representing it in a part-whole model.

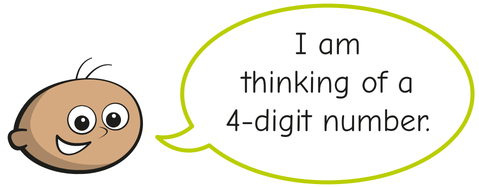


Has Tiny partitioned the number correctly?

Explain your answer.

Yes

The order of the parts does not matter, as long as they have the correct value.



Use the clues to work out Tommy's number.

- The thousands digit is 3 greater than the tens digit.
- The total sum of digits is 16
- The 4-digit number is odd.
- The tens digit is 2
- The hundreds digit is double the ones digit.

Think of another 4-digit number and challenge a partner to work out your number from clues.

5,623

Flexible partitioning of numbers to 10,000

Notes and guidance

In this small step, children explore flexible partitioning of numbers up to 10,000, understanding that the whole number can be split into parts in many different ways.

Children use numerals, words and expanded form in their partitioning. A key focus should be appreciating that, for example, 6,000 + 400 + 20 + 9 = 5,000 + 1,400 + 20 + 9, as this is crucial to understanding addition and subtraction of 4-digit numbers in future blocks.

The representations used in previous small steps can provide support, arranging place value counters or base 10 to appreciate that the different partitions give the same number. When working in adjacent columns in a place value chart, links should be made to exchanges as this will support learning in later blocks.

Things to look out for

- Children may believe that 4-digit numbers can only be partitioned one way into thousands, hundreds, tens and ones.
- When identifying a number that has been partitioned in a non-standard way, children may just combine the digits rather than consider their place value, for example 5,000 + 1,400 + 20 + 9 = 51,429

Key questions

- How can you write the number using a part-whole model?
- What different multiples of 1,000 could be the first part? How does this affect the values of the other parts?
- What can you exchange the thousands/hundreds/tens/ones digit for?
- How do you work out the whole, given the parts?

Possible sentence stems

- ______ is equal to ______ thousands, ______ hundreds, ______ tens and ______ ones or ______ thousands, ______ hundreds, ______ tens and ______ ones.
- ______ = ______ + ______ + ______ + ______
  or ______ + ______ + ______ + ______

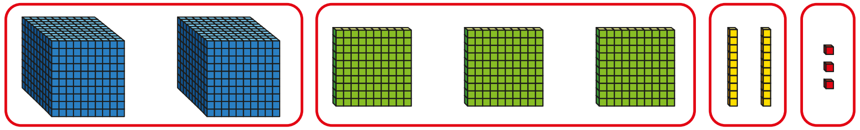
National Curriculum links

- Recognise the place value of each digit in a 4-digit number (thousands, hundreds, tens and ones)
- Identify, represent and estimate numbers using different representations

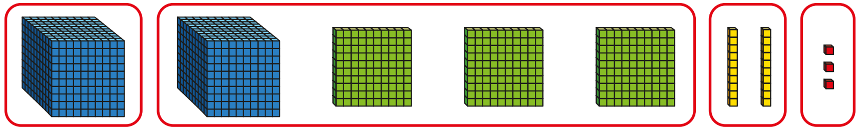
Flexible partitioning of numbers to 10,000

Key learning

- Complete the number sentences.



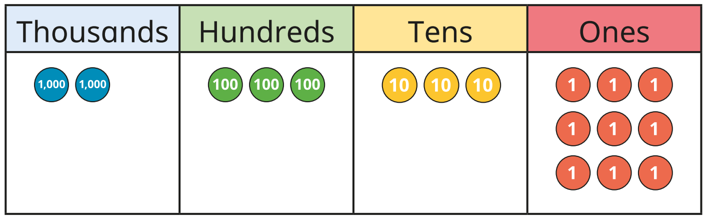
2,323 = 2,000 + ______ + ______ + ______



2,323 = ______ + ______ + ______ + ______

How else can 2,323 be partitioned?

- Use the place value chart to complete the number sentences.

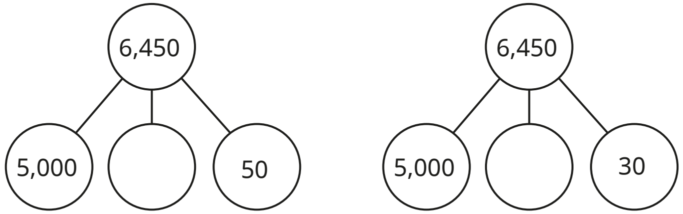


2,339 = 2,000 + ______ + 30 + 9

2,339 = 2,000 + 300 + ______ + 19

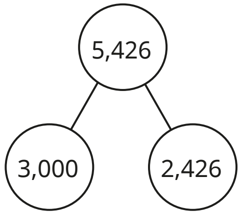
2,339 = 1,000 + ______ + 30 + 9

- Complete the part-whole models.



What is the same and what is different?

- Here is one way of partitioning 5,426 into two parts.



Find three other ways of partitioning 5,426 into two parts.

Compare answers with a partner.

- Complete the number sentences.
  - 8,432 = 7,000 + ______ + 31
  - 6,729 = 3,000 + ______ + 19 + ______
  - 9,310 = ______ + 110 + ______

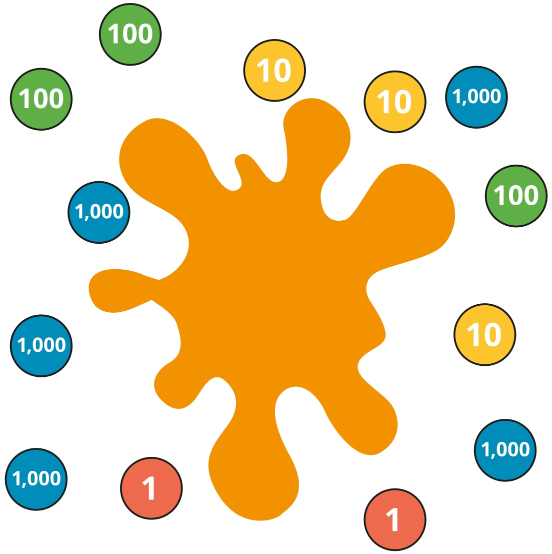
Is there more than one way of completing each sentence?

Flexible partitioning of numbers to 10,000

Reasoning and problem solving

Some place value counters are hidden.

The total is six thousand, four hundred and thirty-two.



Which place value counters could be hidden?

Find at least three solutions.

multiple possible answers, e.g.

1 thousand and 1 hundred

10 hundreds and 10 tens

11 hundreds

Which is the odd one out?

3,500	3 thousands + 50 tens
2 thousands + 15 hundreds	35 tens

Explain how you know.

35 tens = 350

Scott and Esther are each thinking of a number.

- Scott's number has 53 hundreds, 6 tens and 2 ones.
- Esther's number has 5 thousands, 36 tens and 1 one.

Who is thinking of the greater number?

How do you know?

Scott

Find 1, 10, 100, 1,000 more or less

Notes and guidance

In Year 3, children found 1, 10 and 100 more or less than a 3-digit number. In this small step, they find 1, 10, 100 and 1,000 more or less than a number with up to four digits.

Using base 10, place value counters and plain counters in a place value chart will support understanding, particularly when multiples of 10/100/1,000 are crossed. It is also important to explore examples that result in zero as a placeholder, as this concept needs regular reinforcing.

Draw attention to which place value columns change and which stay the same in each example. This allows children to generalise that, for example, when finding 100 more/less, the ones and tens never change, the hundreds always change and the thousands sometimes change.

Things to look out for

- Calculations that cross a boundary may cause confusion.
- Children may need support with the use of zero as a placeholder.
- Children may think that when finding, for example, 100 less than a number, only the digit in the hundreds column will ever change.

Key questions

- How many ones/tens/hundreds/thousands are in ______? How will the number change if you add an extra 1/10/100/1,000?
- Which column changes if you find 1,000 more/less than a number?
- Can finding 1/10/100 more/less change more than one column? When does this happen?
- Do you need to make an exchange?
- How can you find 100 less than 8,012? What exchange do you need to make?
- Which columns stay the same/change?

Possible sentence stems

- There are ______ tens/hundreds/thousands in ______
- 1 more/less ten than ______ tens is ______ tens.
- ______ more/less than ______ is ______

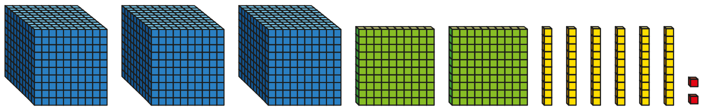
National Curriculum links

- Find 1,000 more or less than a given number

Find 1, 10, 100, 1,000 more or less

Key learning

- Complete the sentences.



The number is ______

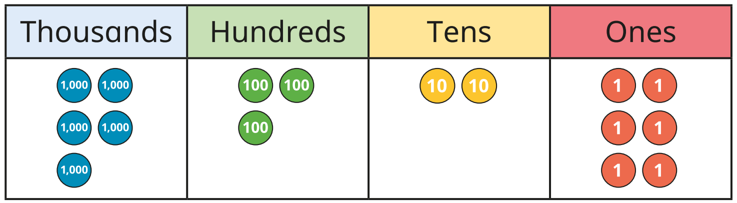
1 less than the number is ______

10 less than the number is ______

100 less than the number is ______

1,000 less than the number is ______

- Complete the sentences.



The number is ______

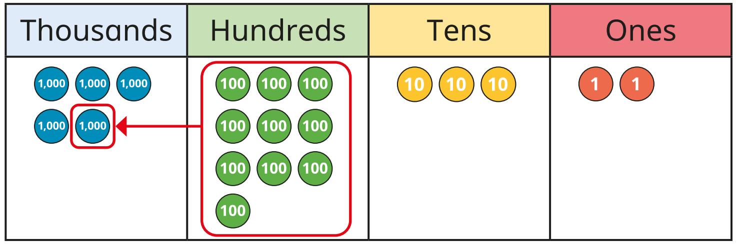
1 more than the number is ______

10 more than the number is ______

100 more than the number is ______

1,000 more than the number is ______

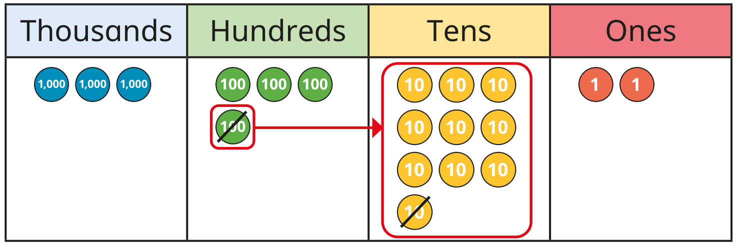
- The place value chart shows that 100 more than 4,932 is 5,032



Use this method to find the values.

100 more than 3,904	10 more than 1,993	1 more than 8,999

- The place value chart shows that 10 less than 3,402 is 3,392



Use this method to find the values.

100 less than 2,034	10 less than 1,903

Find 1, 10, 100, 1,000 more or less

Reasoning and problem solving

Are the statements always true, sometimes true or never true?

When you find 100 more or less than a number, the tens column changes.

When you find 10 more or less than a number, the tens column changes.

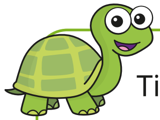
When you find 1 more or less than a number, the thousands column changes.

Explain your reasoning.

never true

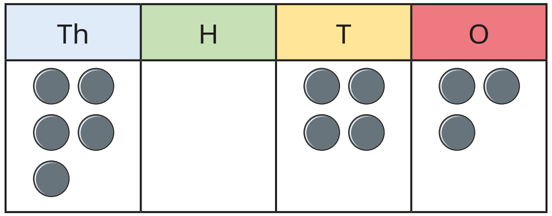
always true

sometimes true



Tiny has put some counters on a place value chart.

One counter has fallen off.



List all the possible numbers that Tiny could have started with.

6,043

5,143

5,053

5,044

Ron and Dora are thinking of different numbers.

1,000 more than Ron's number is 3,942

Dora's number is 100 more than Ron's number.

What are Ron and Dora's numbers?

Ron: 2,942

Dora: 3,042

Complete the function machines.

input		output
4,896	+ 1,000	
3,784		2,784
	– 100	986

5,896

– 1,000

1,086

Number line to 10,000

Notes and guidance

Building on previous learning of number lines to 1,000, children now move on to look at number lines to 10,000

Children label, identify and find missing values on blank or partially completed number lines. Using real-life scales, such as rulers and measuring jugs, can be helpful here.

When looking at partially completed number lines, it is important children become confident in finding the difference between the start and end points and dividing to find the value of each interval. Examples should be used that have a varying number of intervals and unmarked values in different positions.

Children should also be able to work out the value at the midpoint of an interval.

Things to look out for

- Children may count the number of divisions, rather than the intervals.
- Support may be needed to work out the midpoint of an interval.
- Children may assume the increments on the number line are each worth one unit, focusing solely on the starting number.

Key questions

- What are the values at the start and end points of the number line?
- What is the difference in value between the start and end points?
- How many intervals are there?
- How can you work out what each interval is worth?
- How can you work out the halfway point of an interval?
- What other numbers can you mark on the number line?
- Why are the start and end values of a number line important?

Possible sentence stems

- The difference in value between the start and end of the number line is ______
- There are ______ intervals. Each interval is worth ______

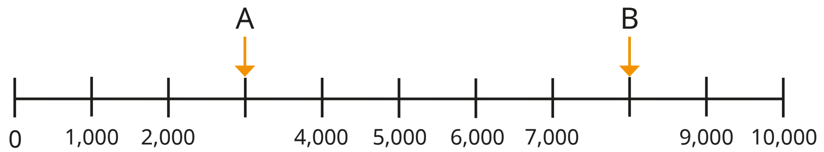
National Curriculum links

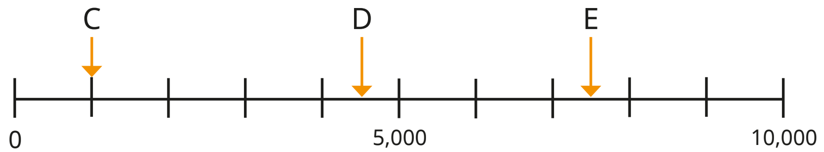
- Identify, represent and estimate numbers using different representations
- Order and compare numbers beyond 1,000

Number line to 10,000

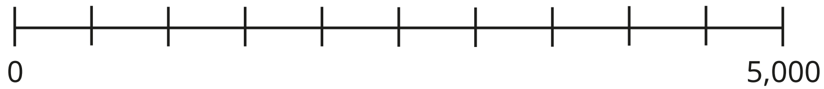
Key learning

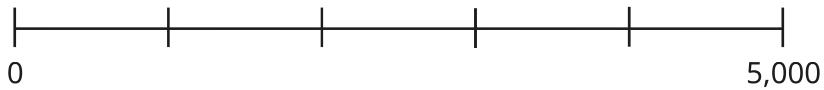
- What numbers are the arrows pointing to?





- Label the number lines.





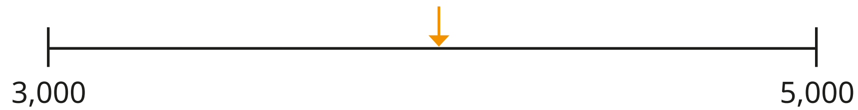
- Mark the positions of the numbers on the number line.

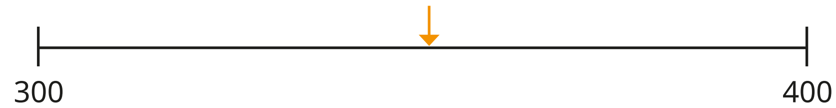
6,000	5,000	1,500	8,000

- Label 5,100 and three other numbers on the number line.

Compare answers with a partner.

- For each number line, estimate the number the arrow is pointing to.



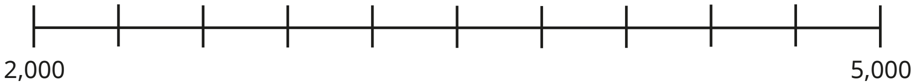


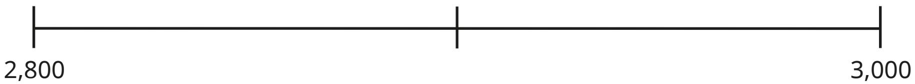
What do you notice?

Number line to 10,000

Reasoning and problem solving

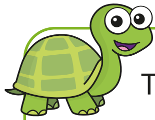
Label 2,900 on each number line.





What do you notice?

Children should draw an arrow in the correct position on each number line.



Tiny is working out the missing values on a scale.

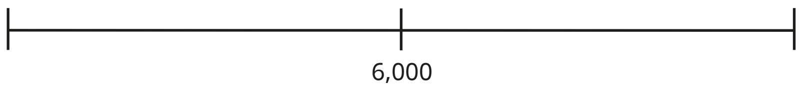
1,000 – 0 = 1,000
1,000 ÷ 6 = ?

Explain the mistake that Tiny has made.

There are 6 divisions, but only 5 intervals.

Tiny needs to divide by 5

What could the start and end numbers be?



multiple possible answers, e.g. 5,000 and 7,000

Estimate on a number line to 10,000

Notes and guidance

In previous years, children explored estimating on number lines. In this small step, they estimate on number lines up to 10,000

Children discuss suitable estimates from the information given on the number line and the value of each interval, justifying their choices. Encourage children to identify the midpoint and to mark on additional points, for example one-quarter and three-quarters of the way along, to help them position the numbers.

It may be useful to consider the position of numbers relative to the midpoint of a number line, for example 6,429 is closer to 6,000 than 7,000 and it is less than halfway between the two points. This will be a useful skill later in the block when children look at rounding.

Things to look out for

- Children may worry that they need to find the exact position or value.
- The scale may be misinterpreted, for example thinking a mark close to 10,000 is 9,999 when 9,000 would be more appropriate.

Key questions

- What is the midpoint of the number line?
- How does knowing the midpoint help you to place the number on the number line?
- What other numbers could you mark on accurately?
- Which division is the arrow close to? Is the number greater than or less than this value?
- How would splitting the line into more intervals help?
- How accurate do you think your estimate is?

Possible sentence stems

- The difference in value between the start and end of the number line is ______
- The midpoint of the number line is ______
- ______ is closer to ______ than ______

National Curriculum links

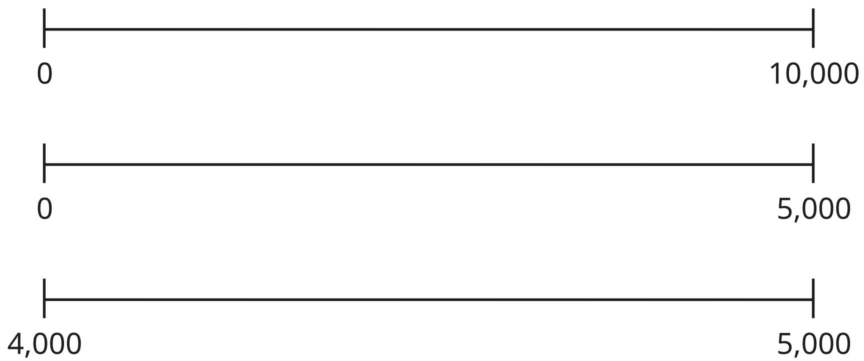
- Identify, represent and estimate numbers using different representations
- Order and compare numbers beyond 1,000

Estimate on a number line to 10,000

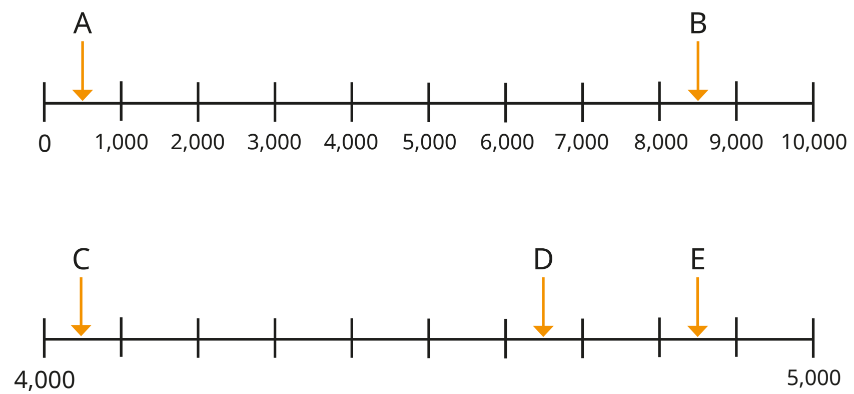
Key learning

- Mark the midpoint of each number line.

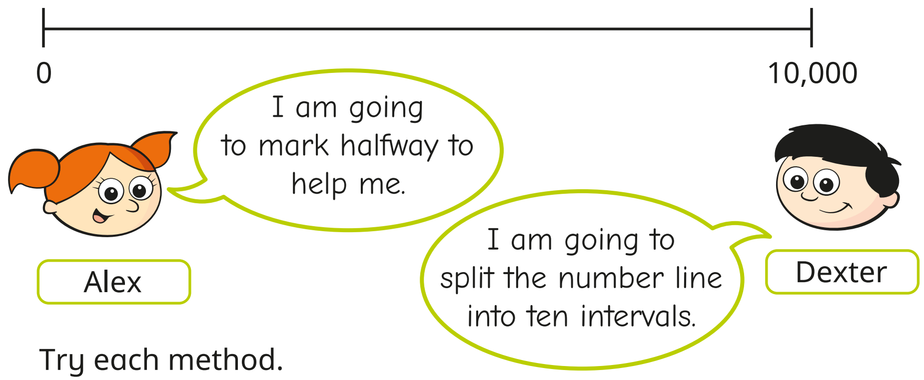
  What number does each midpoint represent?



- Estimate the numbers the arrows are pointing to.



- Alex and Dexter are marking 8,000 on the number line.



  Try each method.

  Whose method did you find easier?

  Which method do you think is more accurate?

- Draw arrows to show the approximate positions of the numbers on the number line.

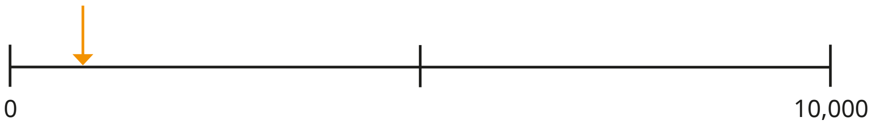
  9,000 | 100 | 5,000 | 2,389

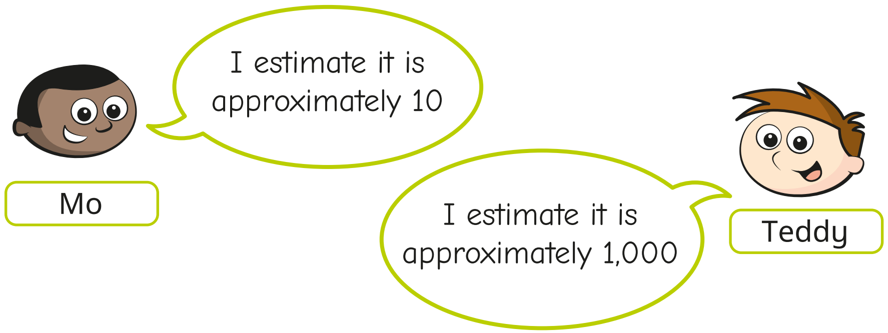
  Compare methods with a partner.

Estimate on a number line to 10,000

Reasoning and problem solving

Mo and Teddy are estimating the number that the arrow is pointing to.



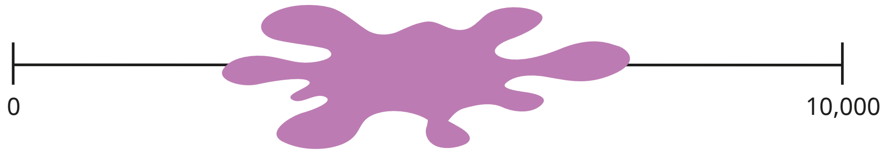


Who do you agree with?

Explain your answer.

Teddy's estimate is more realistic. The midpoint is 5,000 10 would be much closer to zero.

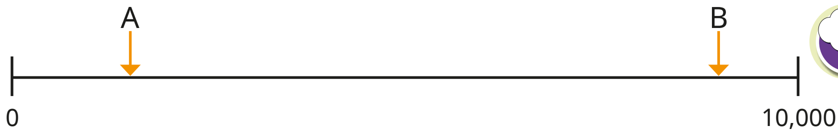
Miss Rose has spilt some paint on the number line.



Estimate three numbers that could appear under the paint.

Explain your answers.

numbers between 3,000 and 7,500



- C is greater than A.
- C is less than half of B.

Give three possible values for C.

e.g. A = 1,500   B = 9,000   C = between 1,500 and 4,500

Compare numbers to 10,000

Notes and guidance

This small step focuses on comparing numbers up to 10,000 using language such as greater/smaller than, less/more than. Once they are confident with the language used for comparisons, children progress to using the inequality symbols, <, > and =, which they have encountered in previous years.

Representations such as base 10, place value counters and charts, and number lines support children's understanding of place value, allowing them to compare numbers visually before moving on to more abstract forms.

Demonstrate to children that when comparing numbers, they need to start with the greatest place value. If the digit in the greatest place value is the same, they need to look at columns to the right until they find different digits.

Things to look out for

- When comparing numbers, children may compare the smallest place value first.
- Children may interpret the inequality symbols incorrectly, confusing < and >
- Children may be confused by numbers with a different number of digits or numbers that contain placeholders.

Key questions

- What is the value of the first digit in ______?
- What is the value of the ______ digit in ______?
- How many thousands/hundreds/tens/ones are there?
- Which column do you start comparing from?
- Which digit in each number has the greatest value? What is the value of these digits?
- When comparing two numbers, if the first digits are equal in value, what do you look at next?
- Which is the greater number? How do you know?

Possible sentence stems

- If the digits in the ______ column are the same, I need to look in the ______ column.
- ______ is greater than ______ because …
- ______ is less than ______ because …

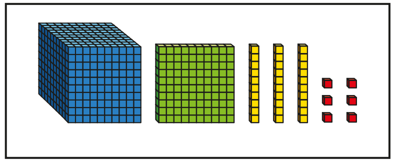
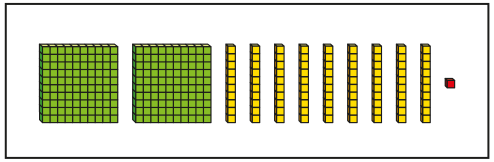
National Curriculum links

- Order and compare numbers beyond 1,000

Compare numbers to 10,000

Key learning

- Which is the greater number? How do you know?

Complete the sentences.

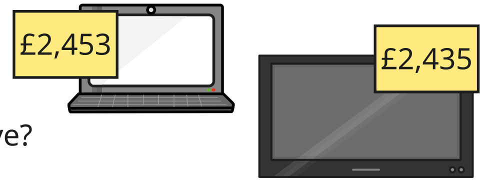
_______ is less than _______

_______ is greater than _______

- A laptop costs £2,453

  A TV costs £2,435

  Which item is more expensive?



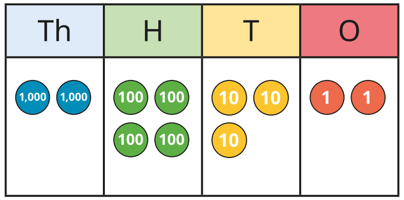
- Complete the statements.

Th	H	T	O
8	0	3	4
8	0	2	9

8,034 is _______ than 8,029

8,029 ◯ 8,034

- Write <, > or = to compare the numbers.



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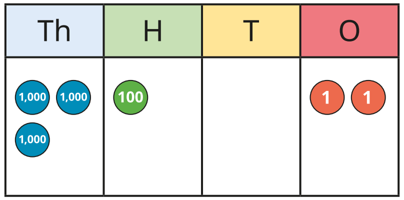

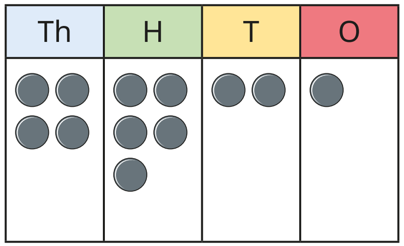

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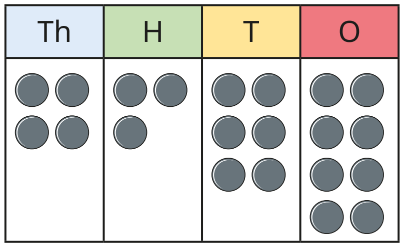


- Write <, > or = to compare the numbers.

321 g ◯ 3,012 g

98 ◯ 1,032

3,402 ◯ 1,897

4,283 ◯ 4,238

7,000 m ◯ 4,629 m

£5,612 ◯ £5,628

4,002 ◯ 865

1,902 ◯ 1,920

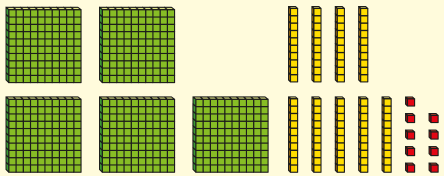
White Rose Maths

Compare numbers to 10,000

Reasoning and problem solving

Sort the cards into the table.

- 5 thousands
- 4,000 + 300 + 50 + 9
- 100 less than 5,090
- 8,543
- one thousand, seven hundred and six



Numbers 5,000 or greater	Numbers less than 5,000

5,000 or greater:

5,000

8,543

less than 5,000:

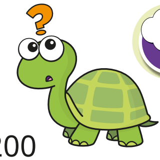
4,359

4,990

1,706

599

Tiny is thinking of a number.



- It is greater than 4,200 but less than 5,800
- The digits sum to 16

What number could Tiny be thinking of?

Give four possible answers.

various possible answers, e.g.

4,219

5,227

4,930

5,713

Use the digit cards to complete the comparison.

1	2	3	4	5

You can use each digit once only.

5,64__ < __,73__

2,__38 > 2,3__5

various possible answers, e.g.

5,641 < 5,732

2,438 > 2,335

Order numbers to 10,000

Notes and guidance

In this small step, children order a set of numbers up to 10,000

Children order numbers from the smallest to the greatest and the greatest to the smallest. They also use language such as “ascending” and “descending” when putting the numbers in order. Children are given examples where the same digit is used in the thousands or the hundreds column so that they need to look at the other digits to determine the value. They also include zero in different places to check understanding of placeholders.

Base 10 and place value counters are used to represent numbers to help children make comparisons. Making links with numbers in real-life situations, such as prices and measurements, is also useful.

Things to look out for

- Children may just look at the digits and not consider the place value.
- Children may need to be reminded of the meanings of the words “ascending” and “descending”.
- Children may need to be reminded about inequality symbols and their meanings.

Key questions

- Which digit in each number has the greatest value? What are the values of these digits?
- When comparing two numbers with the same number of digits, if the first digits are equal in value, what do you look at next?
- What is the difference between ascending and descending order?
- What is different about comparing numbers with the same number of digits and comparing numbers with different numbers of digits?

Possible sentence stems

- ______ is greater than ______, so ______ thousand is greater than ______ thousand.
- ______ is less than ______, so ______ thousand is less than ______ thousand.

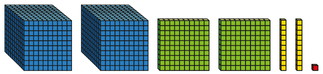
National Curriculum links

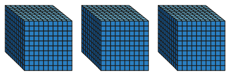
- Order and compare numbers beyond 1,000

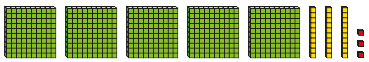
Order numbers to 10,000

Key learning

- Nijah, Dani and Brett are making numbers with base 10

Nijah 

Dani 

Brett 

Who has made the greatest number?

Who has made the smallest number?

How do you know?

- Tom makes four numbers using place value counters.

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

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

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

Th	H	T	O
1,000 1,000 1,000 1,000 1,000			1

Write Tom's numbers in order, from the smallest to the greatest.

- Here are four digit cards.

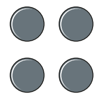
4	0	5	3

Arrange them to make five different 4-digit numbers.

Put your numbers in ascending order.

- Put four counters in the place value chart to make six different numbers.

Thousands	Hundreds	Tens	Ones



Write your numbers in descending order.

- Write the amounts in order. Start with the smallest amount.

£599	£1,732	£1,042	£1,742

Write the measurements in order. Start with the greatest measurement.

4,212 m	8,056 m	916 m	4,209 m

Order numbers to 10,000

Reasoning and problem solving

These numbers are in order from greatest to smallest.

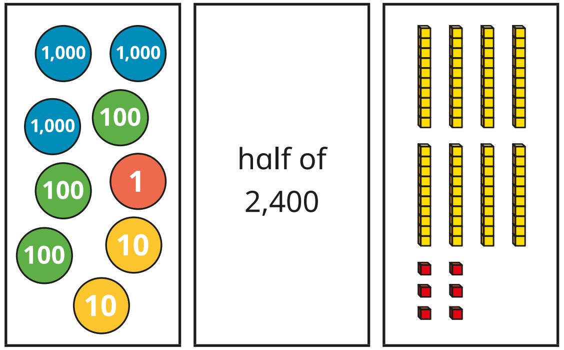
3,6__4   3,__29   3,5__8

The same digit is missing from each number.

What is the missing digit?

6

Put the numbers in ascending order.



86 (base 10)

1,200 (half of 2,400)

3,321 (counters)

Aisha has written five numbers in ascending order.

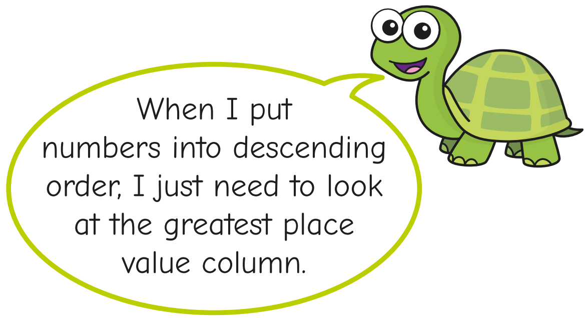
1,354   3,273   4,314   889   9,993

smallest   greatest

What mistake has she made?

Aisha has focused on the first digit and not necessarily its value.

889 is a 3-digit number and is the smallest.



Is Tiny correct?

Explain your answer.

No

Roman numerals

Notes and guidance

Children build on their knowledge of Roman numerals from 1 to 12 on a clock face, and learn that L represents 50 and C represents 100

Children explore the similarities and differences between the Roman number system and our number system, understanding that the Roman system does not have a zero and does not use placeholders. They are already familiar with the idea that, for example, 4 is written as IV rather than IIII, and they apply the same concept to write 40 as XL and 90 as XC.

Roman numerals can be revisited later in this block (for example, rounding XXV to the nearest 10) or within the addition and subtraction block.

Things to look out for

- Children may mix up which letter stands for which number.
- Children may add the individual values together instead of interpreting the values based on their position, for example interpreting XC as 110 instead of 90
- It is more difficult to convert numbers that require large strings of Roman numerals.
- Children may think that numbers like 99 can be written as IC instead of XCIX.

Key questions

- What patterns can you see in the Roman number system?
- What rules do you use when converting numbers to Roman numerals?
- What letters are used in the Roman number system? What does each letter represent?
- How do you know what order to write the letters in when using Roman numerals?
- What is the same and what is different about representing the number twenty-nine in the Roman number system and our number system?

Possible sentence stems

- The letter ______ represents the number ______
- I know ______ is greater than ______ because ______

National Curriculum links

- Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value

Roman numerals

Key learning

- Write each number in Roman numerals.

20	50	60	62
64	78	85	99

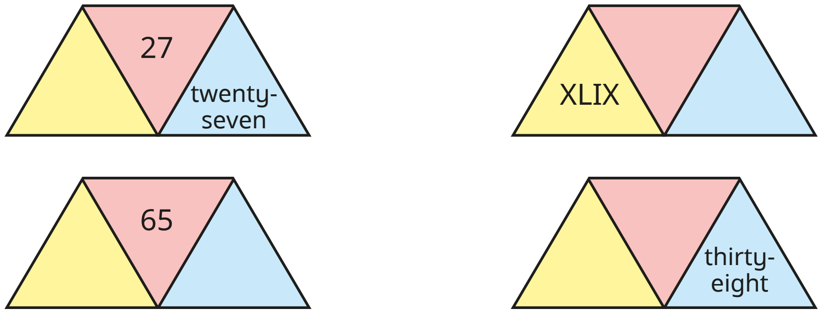
- Four numbers are written in Roman numerals.

XXIV	LIX
LXXXVII	XCVII

What are the numbers?

- Each diagram should show a number in numerals, words and Roman numerals.

Complete the diagrams.



- Choose the correct answer to each calculation.

▸ L + L	LL	X	C	V
▸ C – X	CX	XC	V	L
▸ IX + XI	XX	XXII	IXXI	IXIX

- Complete the function machines.

input LXXV → + 10 → output ☐

input ☐ → – 1 → output XXXI

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

49 ◯ L	XL ◯ 21 + 19
IV ◯ VI	L ◯ C – L
C ◯ LX	XC – X ◯ C

Roman numerals

Reasoning and problem solving

Is the statement true or false?

XX + II = XXII,
so XXII + XXII = XXIIXXII

Explain your answer.

False

Work out the calculation, giving your answer in Roman numerals.

XIV + XXXVI

Make up some other calculations using Roman numerals that have the same answer.

L

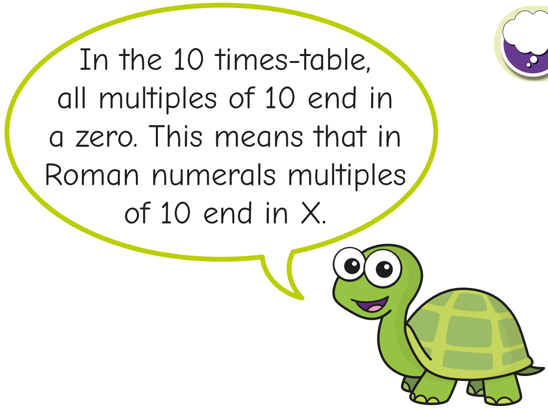
multiple possible answers, e.g.

C ÷ II

L ÷ I

X × V

XXV × II



Is Tiny's statement always, sometimes or never true?

Give examples to support your answer.

sometimes true, e.g.
20 = XX, 80 = LXXX

sometimes false, e.g.
50 = L and 100 = C

Which of these Roman numerals is never written to the left of X?

I	V	X	C

V

Round to the nearest 10

Notes and guidance

In this small step, children are introduced to rounding for the first time, starting with rounding to the nearest 10

Children begin by focusing on rounding 2-digit numbers, as it is clearer what the previous and next multiples of 10 are. When building on this and starting to round 3-digit numbers, it is important to include examples that have zero as a placeholder in the tens column, for example 304, as children can often think that 300 is not a multiple of 10 because it is a multiple of 100

Number lines can be used not only to identify the previous and next multiple of 10, but also which multiple of 10 a number is closer to. Children should understand the convention that when the ones digit is 5, they round to the next multiple of 10

Avoid using language such as "round up" and "round down", as this can create misconceptions.

Things to look out for

- Children may look at the wrong column when deciding which way to round, and use the tens column instead of the ones column.
- Children may think that, for example, 52 "rounds down" and give the result as 42 or 40

Key questions

- What is the multiple of 10 after ______?
- What is the multiple of 10 before ______?
- Which multiple of 10 is ______ closer to? How do you know?
- Which numbers rounded to the nearest 10 result in zero?
- Which place value column do you need to look at to decide which multiple to round to?
- What numbers when rounded to the nearest 10 give the result 50/500?

Possible sentence stems

- The two multiples of 10 the number lies between are ______ and ______
- ______ is closer to ______ than ______
- ______ rounded to the nearest 10 is ______

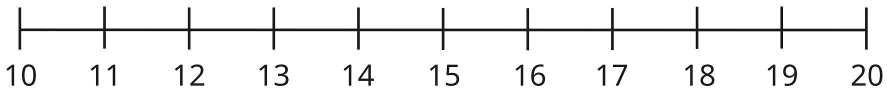
National Curriculum links

- Round any number to the nearest 10, 100 or 1,000

Round to the nearest 10

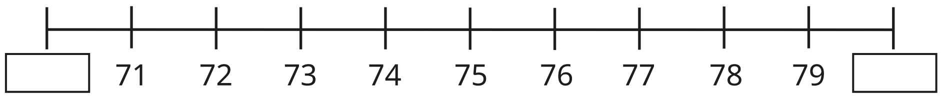
Key learning

- Use the number lines to help you complete the sentences.



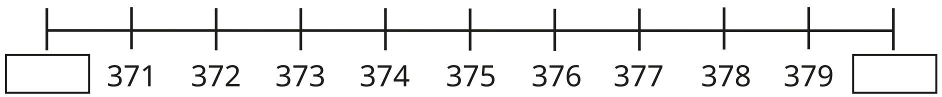
13 is closer to ______ than ______

13 rounded to the nearest 10 is ______



78 is closer to ______ than ______

78 rounded to the nearest 10 is ______

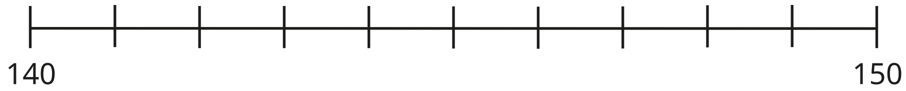


378 is closer to ______ than ______

378 rounded to the nearest 10 is ______

375 rounded to the nearest 10 is ______

- Use the number line to help you complete the sentences.



143 rounded to the nearest 10 is ______

146 rounded to the nearest 10 is ______

145 rounded to the nearest 10 is ______

150 rounded to the nearest 10 is ______

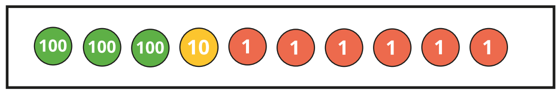
- Round each number to the nearest 10

34 140 345 898 203

- Which numbers round to 760 to the nearest 10?

761 **765** **760** **763** **755**

- Round each number to the nearest 10

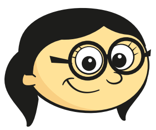


LVII

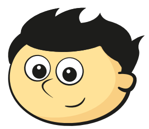
Round to the nearest 10

Reasoning and problem solving

Annie and Jack are rounding 562 to the nearest 10



Annie: It rounds to 570 because 6 is more than 5



Jack: It rounds to 560 because 2 is less than 5

Who do you agree with?

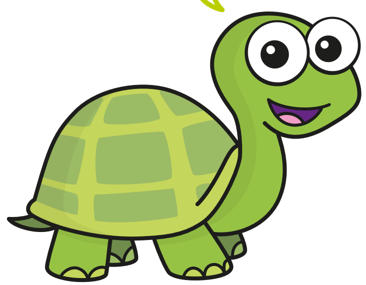
Explain your answer.

Jack

When rounded to the nearest 10, there are 350 children in a running club.

How many children could there be?

345, 346, 347, 348, 349, 350, 351, 352, 353 or 354



445 can round to 440 or 450

What mistake has Tiny made?

If the ones digit is a 5, the number rounds to the next multiple of 10

445 rounds to 450

Round to the nearest 100

Notes and guidance

Building on the previous step, children now begin to round numbers to the nearest 100

Children begin by focusing on rounding 3-digit numbers, as it is clearer what the previous and next multiples of 100 are. It is important to discuss what is the same and what is different when rounding numbers to 10 and 100. By doing this, children can begin to understand that when asked to round to a given amount, they need to look at the next place value column to the right.

It is helpful to use examples that are less than 50, so children see that these round to the previous multiple of 100, which is zero.

As in the previous step, avoid using language such as "round up" and "round down", as this can create misconceptions.

Things to look out for

- Children may look at the wrong column to decide which way to round and use the hundreds column instead of the tens column.
- Children may focus on rules about "up" and "down" instead of looking at multiples of 100, for example rounding 432 to 402 or 332

Key questions

- What is the multiple of 100 after ______?
- What is the multiple of 100 before ______?
- Which multiple of 100 is ______ closer to? How do you know?
- Which numbers rounded to the nearest 100 result in zero?
- Which place value column do you need to look at to decide which multiple to round to?
- What is the same and what is different about rounding to the nearest 10 and rounding to the nearest 100?

Possible sentence stems

- The two multiples of 100 the number lies between are ______ and ______
- ______ is closer to ______ than ______
- ______ rounded to the nearest 100 is ______

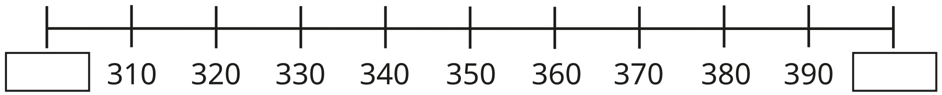
National Curriculum links

- Round any number to the nearest 10, 100 or 1,000

Round to the nearest 100

Key learning

- Which multiples of 100 do the numbers lie between?

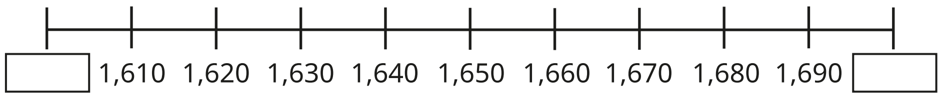


Use the number line to help you complete the sentences.

340 is closer to ______ than ______

340 rounded to the nearest 100 is ______

- Complete the number line and the sentences.



1,610 is closer to ______ than ______

1,610 rounded to the nearest 100 is ______

1,681 is closer to ______ than ______

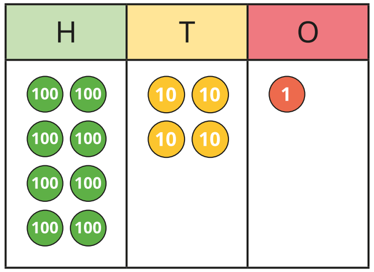
1,681 rounded to the nearest 100 is ______

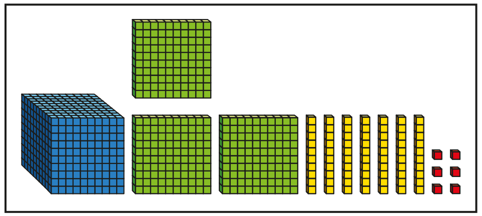
1,650 rounded to the nearest 100 is ______

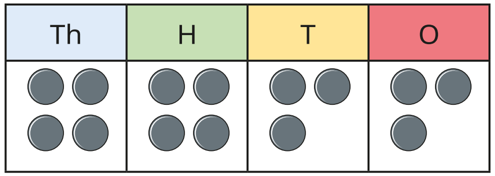
- Round each number to the nearest 100

403	350	728	4,551
76	7,005	49	1,925

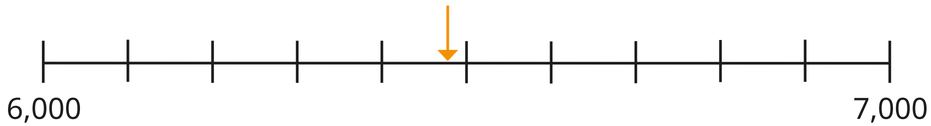
- Round each number to the nearest 100







LXXI



Round to the nearest 100

Reasoning and problem solving

To the nearest 100, there are 600 people at a football match.

What is the smallest number of people that could be at the football match?

What is the greatest number of people that could be at the football match?

How would your answers change if the number of people at the football match was 600 when rounded to the nearest 10?

550

649

595

604

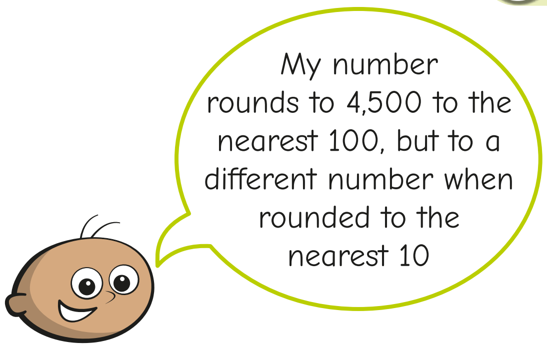
To the nearest 100, there are 4,600 people at a concert.

The sum of the digits in the number is 15

How many people could there be?

4,551, 4,560, 4,605, 4,614, 4,623, 4,632, 4,641

Tommy is thinking of a number.



What number could Tommy be thinking of?

How many answers can you find?

4,450 to 4,494

4,505 to 4,549

Round to the nearest 1,000

Notes and guidance

Building on the previous small steps, children round numbers to the nearest 1,000

Children begin by discussing which multiple of 1,000 a number is closest to. They can then identify that if the digit in the hundreds column is between zero and 4, they round to the previous multiple of 1,000, but if the digit in the hundreds column is 5 or above, they round to the next multiple of 1,000

Children make links with rounding numbers to the nearest 10 or 100, all of which are explored in the next step.

It is helpful to use examples that are less than 500, so children see that these round to the previous multiple of 1,000, which is zero.

As in the previous steps, avoid language such as "round up" and "round down", as this can create misconceptions.

Things to look out for

- Children may look at the wrong column to decide which way to round and use the thousands column instead of the hundreds column.
- Children may focus on rules about "up" and "down" instead of looking at multiples of 1,000, for example rounding 6,432 to 5,432

Key questions

- What is the multiple of 1,000 after ______?
- What is the multiple of 1,000 before ______?
- Which multiple of 1,000 is ______ closer to? How do you know?
- Which numbers rounded to the nearest 1,000 result in zero?
- Which place value column do you need to look at to decide which multiple to round to?
- What is the same and what is different about rounding to the nearest 10, 100 and 1,000?

Possible sentence stems

- The two multiples of 1,000 the number lies between are ______ and ______
- ______ is closer to ______ than ______
- ______ rounded to the nearest 1,000 is ______

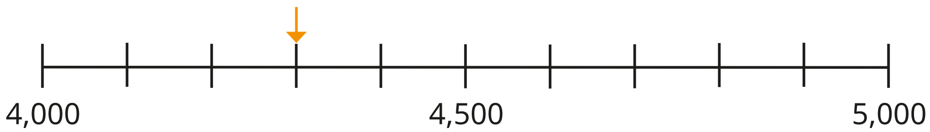
National Curriculum links

- Round any number to the nearest 10, 100 or 1,000

Round to the nearest 1,000

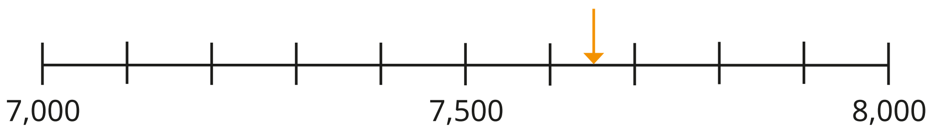
Key learning

- Use the number lines to help you complete the sentences.



4,300 is closer to ______ than ______

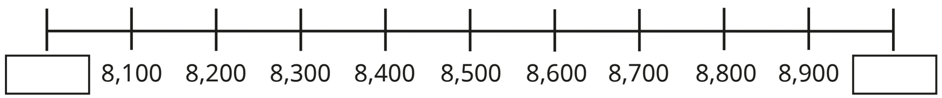
4,300 rounded to the nearest 1,000 is ______



7,650 is closer to ______ than ______

7,650 rounded to the nearest 1,000 is ______

- Complete the number line.



Draw an arrow to show 8,550 on the number line.

8,550 rounded to the nearest 1,000 is ______

- Round each number to the nearest 1,000

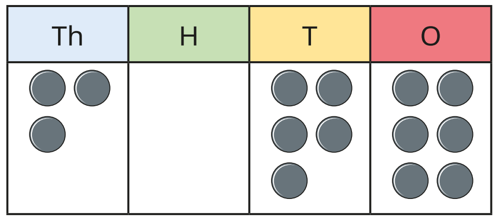
2,290	720	3,450	9,932
5,049	53	6,500	9,502

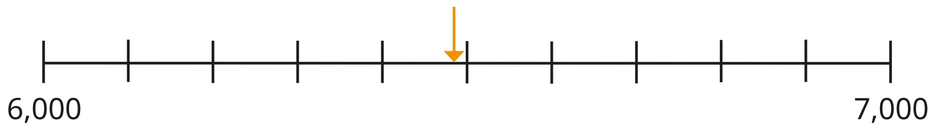
- Which numbers round to 9,000 to the nearest 1,000?

8,099 **9,094** **8,999** **9,499** **8,750** **10,000**

- Round each number to the nearest 1,000

Th	H	T	O
3	7	4	2





four thousand, six hundred and forty-three

Round to the nearest 1,000

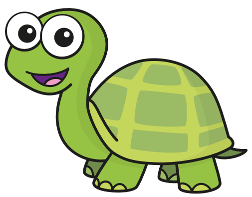
Reasoning and problem solving

Each of the numbers round to 4,000 to the nearest 1,000

What could the missing digits be?

4, __ 28	__ ,842
4,2 __ 8	__ ,482

0 to 4	3
0 to 9	4



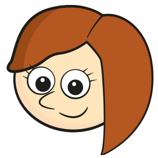
Do you agree with Tiny?

Explain your answer.

No

Rosie makes a 4-digit number using the digit cards.

6	4	9	5



What number could Rosie have made?

Is there more than one possibility?

5,649, 5,694, 5,946, 5,964, 6,459, 6,495

Round to the nearest 10, 100 or 1,000

Notes and guidance

In this small step, children round to the nearest 10, 100 or 1,000, choosing the appropriate columns to look at.

Discuss with children what is the same and what is different when rounding numbers to the nearest 10, 100 or 1,000.
Ensure children understand that when asked to round to a given amount, they need to look at the place value column to the right of that of the required accuracy to decide whether to round to the previous or next multiple. It is worth discussing with children when each degree of accuracy is more appropriate.

As with the previous steps, avoid language such as "round up" and "round down", as this can create misconceptions.

Things to look out for

- When rounding numbers to different degrees of accuracy, children may look at the wrong column(s).
- Children may not realise that the answer can be the same when a number is rounded to different degrees of accuracy.
- When rounding the same number to different degrees of accuracy, children may not always use the starting number but, for example, round it to the nearest 10, then round this value to the nearest 100 and so on.

Key questions

- What is the multiple of 10/100/1,000 after ______?
- What is the multiple of 10/100/1,000 before ______?
- Which multiple of 10/100/1,000 is ______ closer to? How do you know?
- Which numbers rounded to the nearest 10/100/1,000 result in zero?
- Which place value column do you need to look at to decide which multiple to round to?
- What is the same and what is different about rounding to the nearest 10, 100 and 1,000?

Possible sentence stems

- The two multiples of 10/100/1,000 the number lies between are ______ and ______
- ______ is closer to ______ than ______
- ______ rounded to the nearest 10/100/1,000 is ______

National Curriculum links

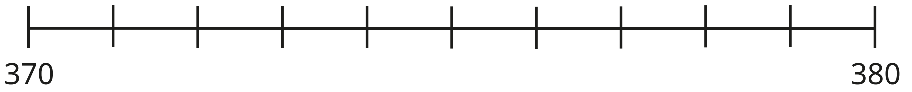
- Round any number to the nearest 10, 100 or 1,000

Round to the nearest 10, 100 or 1,000

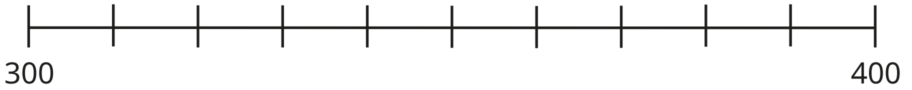
Key learning

- Draw an arrow to mark 376 on each number line.

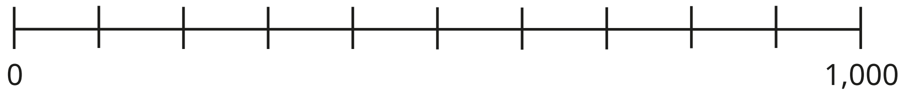
  Complete the sentences.



376 rounded to the nearest 10 is ______

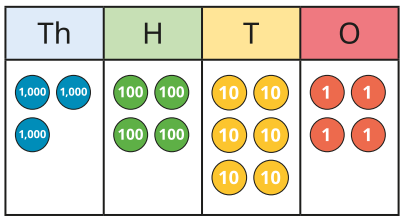


376 rounded to the nearest 100 is ______



376 rounded to the nearest 1,000 is ______

- Here is a number.



Round the number to the nearest 10, 100 and 1,000

- Complete the table.

Number	7,126	4,996	2,006	499
Rounded to the nearest 10				
Rounded to the nearest 100				
Rounded to the nearest 1,000				

- A baker uses 4,285 g of flour.

  Round the mass of flour to the nearest 100 g.

  Round the mass of flour to the nearest 10 g.

  Round the mass of flour to the nearest kilogram.

  Which do you think is the most appropriate way of rounding the number?

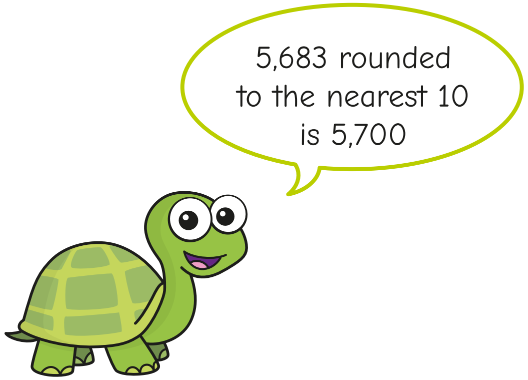
- A school fete raises £2,166

  Round this amount to the nearest £10, nearest £100 and nearest £1,000

  Which do you think is the most appropriate way of rounding the number?

Round to the nearest 10, 100 or 1,000

Reasoning and problem solving



What mistake has Tiny made?

What is the correct answer?

Tiny has rounded to the nearest 100 instead of the nearest 10

5,680

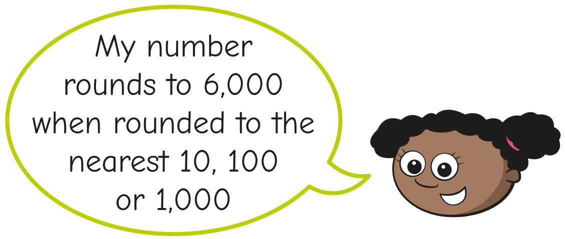
Would you round to the nearest 10, 100 or 1,000?

- number of people at a football match
- number of children at a school
- number of coins in a jar

Discuss this as a class.

Whitney puts some counters on a place value chart to make a number.

Th	H	T	O



What could Whitney's number be?

What must Whitney's number be if she uses exactly 30 counters?

between 5,995 and 6,004

5,997

Autumn Block 2

Addition and subtraction

Small steps

Step 1	Add and subtract 1s, 10s, 100s and 1,000s
Step 2	Add up to two 4-digit numbers – no exchange
Step 3	Add two 4-digit numbers – one exchange
Step 4	Add two 4-digit numbers – more than one exchange
Step 5	Subtract two 4-digit numbers – no exchange
Step 6	Subtract two 4-digit numbers – one exchange
Step 7	Subtract two 4-digit numbers – more than one exchange
Step 8	Efficient subtraction

Small steps

Step 9	Estimate answers
Step 10	Checking strategies

Add and subtract 1s, 10s, 100s and 1,000s

Notes and guidance

In Year 3, children explored adding and subtracting 1s, 10s and 100s to/from any 3-digit number, including using a mental strategy when crossing a multiple of 10 or 100

In this small step, children recap this learning and extend their understanding to dealing with 4-digit numbers and adding and subtracting multiples of 1,000. The focus is on mental rather than written strategies, which are covered later in the block.

It is important to explore the effect of either adding or subtracting a multiple of 1, 10, 100 or 1,000 by discussing which columns always, sometimes and never change. For example, when adding a multiple of 100, the ones and tens never change, the hundreds always change and the thousands sometimes change, depending on the need to make an exchange.

Things to look out for

- Children may identify the incorrect place value column, particularly if they are using plain counters in a place value chart, for example 3,469 – 300 = 469 or 3,439
- Confusion may arise with zero as a placeholder.
- Children may find crossing the next or previous multiple challenging.

Key questions

- If you know 2 + 4 = 6, what else do you know?
- How will you partition ______? Why?
- Will the value in the ones/tens/hundreds/thousands column increase or decrease? By how much?
- Which place value columns have changed/stayed the same? Why?
- What is the inverse of subtracting 300?

Possible sentence stems

- The next/previous multiple of 10/100/1,000 is ______
- I can partition ______ into ______ and ______ because …
- The value of the ______ column will increase/decrease by ______

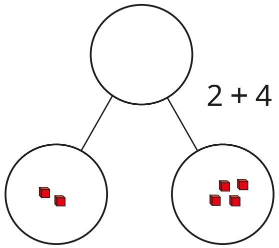
National Curriculum links

- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

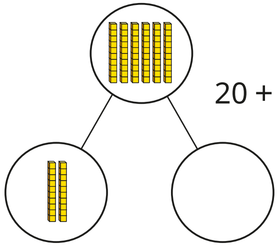
Add and subtract 1s, 10s, 100s and 1,000s

Key learning

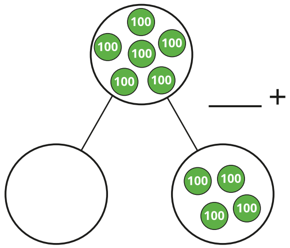
- Complete the part-whole models and number sentences.



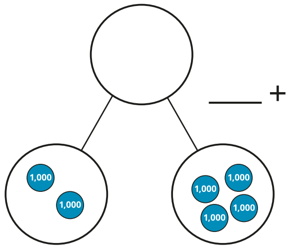
2 + 4 = ____



20 + ____ = 60



____ + ____ = ____



____ + ____ = ____

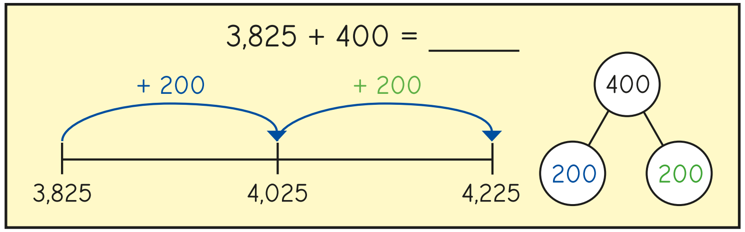
What do you notice?

- Use a place value chart to help you complete the number sentences.
  - 1,364 + 3 = ______
  - 1,364 + 30 = ______
  - 1,364 + 300 = ______
  - 1,364 + 6,000 = ______
  - 1,364 − 1 = ______
  - 1,364 − 60 = ______
  - 1,364 − 200 = ______
  - 1,364 − 1,000 = ______

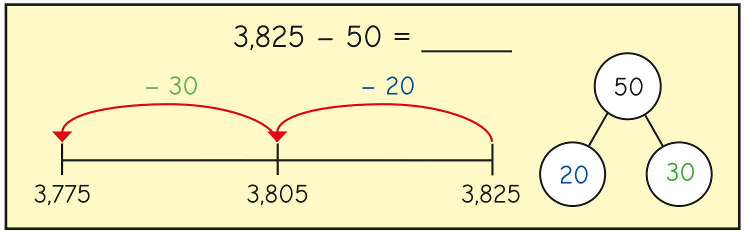
  What do you notice? What stays the same and what changes?

- Amir and Whitney are using number lines to add and subtract.

Amir



Whitney



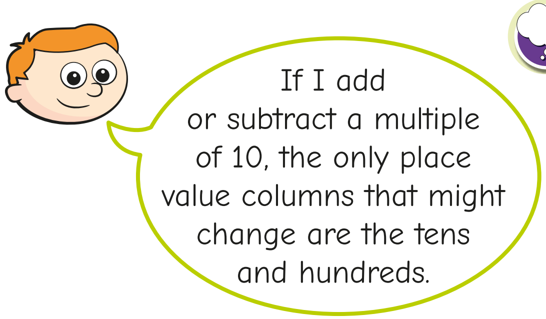
Use this method to work out the calculations.

2,418 + 6	2,418 + 800	2,418 + 90
2,418 − 30	2,418 − 9	2,418 − 700

- There are 1,286 patients and doctors in a hospital.
  300 patients leave after being treated.
  Another 90 patients arrive.
  7 doctors leave.
  How many patients and doctors are in the hospital now?

Add and subtract 1s, 10s, 100s and 1,000s

Reasoning and problem solving

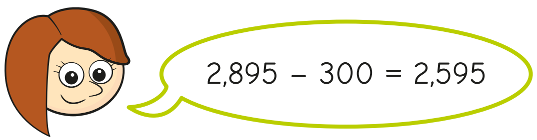


Do you agree with Ron?

Explain your reasons.

Ron is partially correct. However, the thousands may also change, e.g.
1,983 + 30 = 2,013

Rosie is finding the missing number in ______ – 300 = 2,895



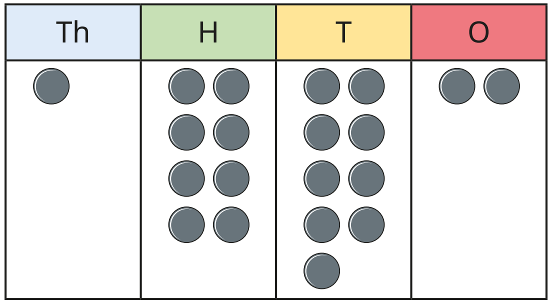
What mistake has Rosie made?

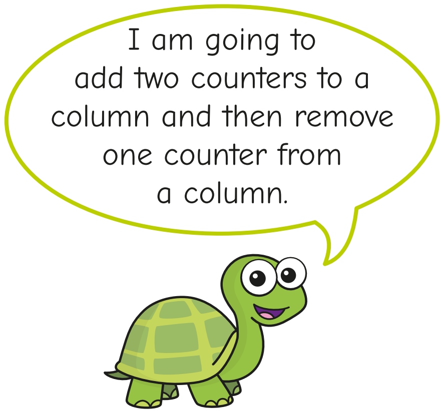
Work out the missing number.

Rosie has subtracted 300 from the answer rather than using the inverse.

3,195

Here is a number on a place value chart.





What number could Tiny have now?

multiple possible answers, e.g.
2,892, 3,792,
3,882, 3,891
1,092

Add up to two 4-digit numbers – no exchange

Notes and guidance

In Year 3, children used the formal written method to add two 2- or 3-digit numbers, with up to two exchanges. In this block, that learning is extended to include 4-digit numbers. In this small step, they add 3- or 4-digit numbers with no exchanges, using concrete resources as well as the formal written method.

The numbers being added together may have a different number of digits, so children need to take care to line up the digits correctly. Even though there will be no exchanging, the children should be encouraged to begin adding from the ones column. When working within each column, ask, "Do you have enough ones/tens/hundreds to make an exchange?" This will prepare them for future small steps where exchanging will be necessary.

Things to look out for

- Children may not line up the digits in the place value columns correctly.
- Children may assume they should start adding from left to right. Be careful as this may appear to be a good strategy given there are no exchanges required in this small step.
- Children may not use zero as a placeholder when there are no hundreds, tens or ones.

Key questions

- How can you represent the question using base 10?
- How can you put these numbers into a place value chart?
- Does it matter which columns you add together first?
- Do you have enough ones/tens/hundreds to make an exchange?
- What do you write in the tens column if there are no tens?

Possible sentence stems

- _____ ones added to _____ ones is equal to _____ ones.
- _____ added to _____ is equal to _____
- I have _____ ones, so I do/do not need to make an exchange.

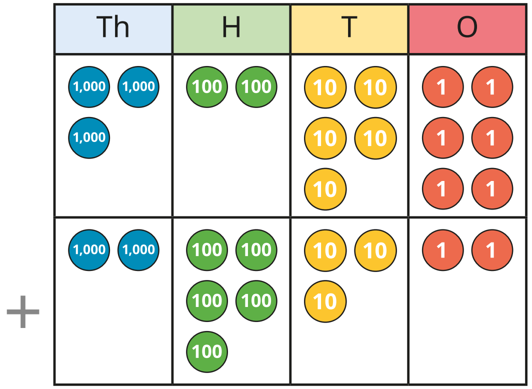
National Curriculum links

- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Add up to two 4-digit numbers – no exchange

Key learning

- Use counters and a place value chart to work out 3,256 + 2,532



	Th	H	T	O
	3	2	5	6
+	2	5	3	2

- Complete the additions.

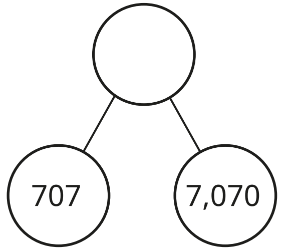
	Th	H	T	O
	4	1	3	5
+	2	6	1	4

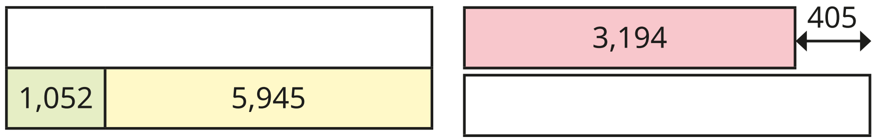
	Th	H	T	O
	3	1	4	2
+		5	3	7

	Th	H	T	O
	5	0	8	1
+	3	7	0	4

	Th	H	T	O
	2	7	0	6
+		1	0	3

- Fill in the missing numbers.





- Work out the missing numbers.

	Th	H	T	O
	4		6	
+	2	5		1
		7	8	9

- Tommy walks 3,420 m.

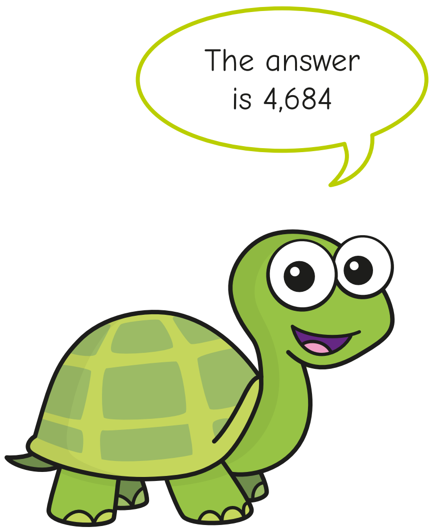
  Eva walks 356 m.

  How far do they walk altogether?

Add up to two 4-digit numbers – no exchange

Reasoning and problem solving

Tiny works out 1,234 + 345



What mistake has Tiny made?

What is the correct answer?

1,579

Dani and Aisha are raising money for charity.

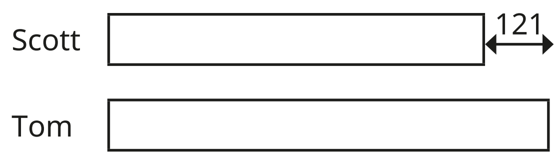
Dani raises £2,304 and Aisha raises £1,695

How much money have they raised altogether?

Scott and Tom are also raising money for charity.

So far, Scott has raised £1,423 and Tom has raised £121 more than Scott.

How much have Scott and Tom raised altogether?



Compare methods with a partner.

£3,999

£2,967

(Tom: £1,544)

Add two 4-digit numbers – one exchange

Notes and guidance

Building on the previous small step, children now add two 4-digit numbers with one exchange in any column. In Year 3, they explored 3-digit addition with up to two exchanges, so they should be familiar with the process.

The numbers can be made using concrete manipulatives such as place value counters in a place value chart, alongside the formal written method. When discussing where to start an addition, it is important to use language such as begin from the "smallest value column" rather than the "ones column" to avoid any misconceptions when decimals are introduced later in the year.

After each column is added, ask, "Do you have enough ones/tens/hundreds to make an exchange?" This question will be an important one in this small step, as the children do not know which column will be the one where an exchange is needed.

Things to look out for

- Children may not line up the digits in the place value columns correctly.
- Children may not add up from the smallest value column, and so will not be able to exchange correctly.
- Children may not use zero as a placeholder when there are no hundreds, tens or ones.

Key questions

- How many thousands/hundreds/tens/ones are there altogether?
- What is ______ more than ______?
- Does it matter which columns you add together first?
- Do you have enough ones/tens/hundreds to make an exchange?
- When exchanging 10 hundreds, where do you put the thousand?

Possible sentence stems

- ______ ones added to ______ ones is equal to ______ ones.
- ______ added to ______ is equal to ______
- I have ______ hundreds, so I do/do not need to make an exchange.
- I can exchange 10 ______ for 1 ______

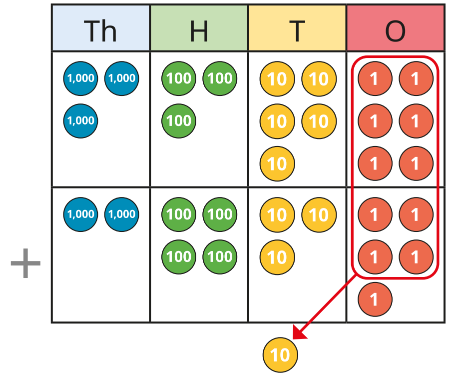
National Curriculum links

- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Add two 4-digit numbers – one exchange

Key learning

- Kim uses counters to find the total of 3,356 and 2,435

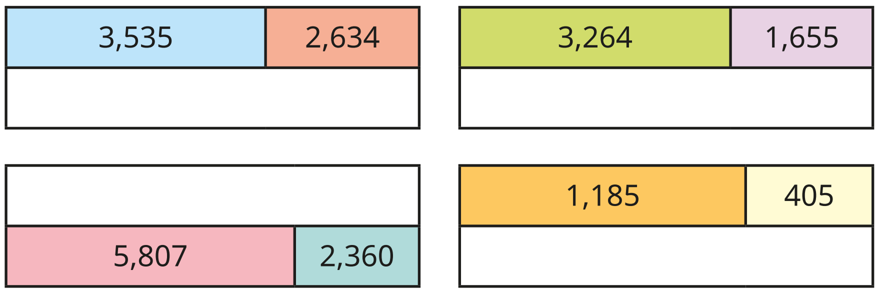


	Th	H	T	O
	3	3	5	6
+	2	4	3	5
	5	7	9	1
			1	

Use Kim's method to work out the additions.

3,356 + 2,437 3,356 + 2,473 3,356 + 2,743

- Complete the bar models.

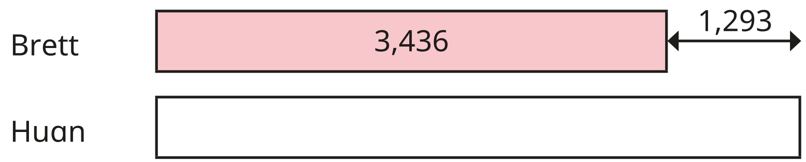


- Find the sum of 6,825 and 1,344

- Brett has 3,436 marbles.

  Huan has 1,293 more marbles than Brett.

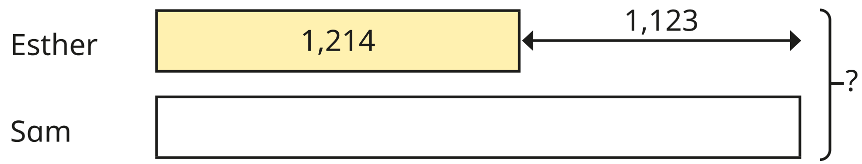
  How many marbles does Huan have?



- Esther has 1,214 stickers.

  Sam has 1,123 more stickers than Esther.

  How many stickers do they have altogether?



- Eva has 1,434 pennies.

  Tom has 1,158 more pennies than Eva.

  How many pennies does Tom have?

Add two 4-digit numbers – one exchange

Reasoning and problem solving

Tiny completes this addition.

	Th	H	T	O
	4	0	8	6
+	1	5	3	2
	5	5	1	9
				1

What mistake has Tiny made?

Find the correct answer.

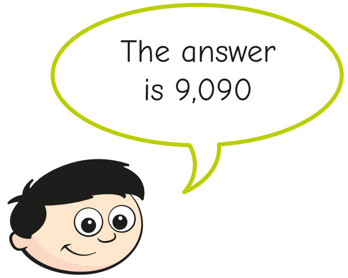
5,618

What is the missing 4-digit number?

	Th	H	T	O
+	6	3	9	5
	8	9	4	9

2,554

Dexter adds a 4-digit number to a 2-digit number.



	Th	H	T	O
+				
	9	0	9	0

What could Dexter's numbers be?

multiple possible answers, e.g.

9,025 + 65

9,040 + 50

8,991 + 99

Add two 4-digit numbers – more than one exchange

Notes and guidance

Building on the previous small step, children now add two 4-digit numbers with more than one exchange.

The numbers are made using place value counters in a place value chart alongside the formal written method. The addition begins from the smallest value column. After each column is added, ask, "Do you have enough ones/tens/hundreds to make an exchange?" This question is important at every stage as there will be more than one exchange to make. With more than one exchange, it is important to model the correct place to write the number exchanged and to add it to the next column.

Things to look out for

- Children may not line up the digits in the place value columns correctly, especially the digits created by exchanging.
- Children may forget to add from the smallest value column first.
- Children may not realise that two digits that look as though they will not total enough to make an exchange could do so once an exchange has happened, for example 5 + 4 plus an extra 1 exchanged from the previous column.

Key questions

- How many ones/tens/hundreds/thousands are there in total?
- What is ______ more than ______?
- Does it matter which columns you add together first?
- Do you have enough ones/tens/hundreds to make an exchange?
- How can you make an exchange in more than one column in the same addition?

Possible sentence stems

- ______ ones added to ______ ones is equal to ______ ones.
- ______ plus ______ plus the 1 that I exchanged from the last column is equal to ______
- I have ______ hundreds/tens/ones, so I do/do not need to make an exchange.

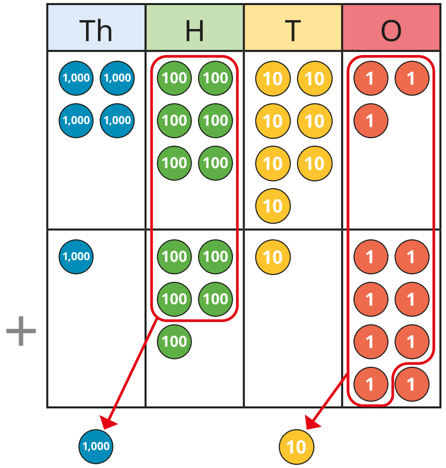
National Curriculum links

- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Add two 4-digit numbers – more than one exchange

Key learning

- Nijah uses place value counters to help her work out 4,673 + 1,518



		Th	**H**	**T**	**O**	
		4	6	7	3	
	+	1	5	1	8	
		6	1	9	1	
		1		1		

Use Nijah's method to work out the additions.

	Th	**H**	**T**	**O**	
	3	2	7	5	
+	6	1	5	6	

	Th	**H**	**T**	**O**	
	5	9	3	4	
+	2	2	4	6	

	Th	**H**	**T**	**O**	
	1	7	7	2	
+	2	2	5	0	

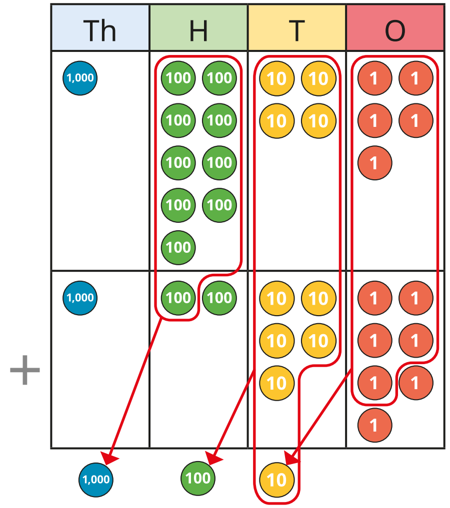
- Complete the additions.

4,507 + 1,648

4,507 + 674

4,507 + 95

- Jack uses place value counters to work out 1,945 + 1,257



		Th	**H**	**T**	**O**	
		1	9	4	5	
	+	1	2	5	7	
		3	2	0	2	
		1	1	1		

Use Jack's method to work out the additions.

4,893 + 1,758

3,546 + 1,794

2,305 + 1,896

- White Rose FC are playing a football match against Red Rose Rovers.

  2,438 fans come to watch White Rose FC.

  1,765 fans come to watch Red Rose Rovers.

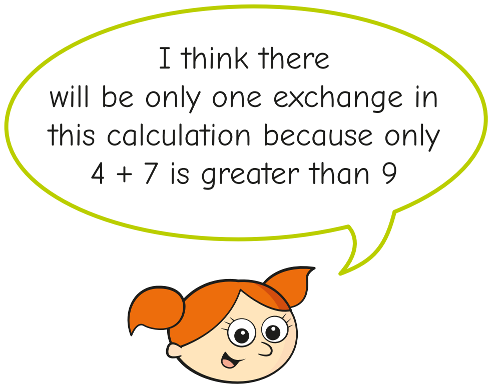
  How many fans come to watch the match altogether?

Add two 4-digit numbers – more than one exchange

Reasoning and problem solving

Alex is working out this addition.

	Th	H	T	O
	1	3	6	4
+	1	2	3	7



Is Alex correct?

Explain how you know.

No

Teddy works out 3,218 + 1,354

	Th	H	T	O
	3	2	1	8
+	1	3	5	4
			2	

How do you know that Teddy's answer cannot be correct?

When adding two numbers together, the greatest digit that can be carried over is 1

Rosie and Mo each have some points on a computer game.

Mo has 599 fewer points than Rosie.

Mo has 4,278 points.

How many points do they have altogether?

9,155

White Rose Maths

Subtract two 4-digit numbers – no exchange

Notes and guidance

In Year 3, children used the formal written method to subtract two 2- or 3-digit numbers with up to two exchanges. In this block, that learning is extended to include 4-digit numbers. In this small step, children subtract up to a 4-digit number from a 4-digit number with no exchanges, using concrete resources as well as the formal written method.

Even though there is no exchanging, children should subtract from the smallest value column first. Before subtracting each column, ask, "Do you have enough ones/tens/hundreds to subtract ______?" If not, an exchange is needed.

Encouraging children to subtract from the "smallest value column" first, rather than referring to it as the "ones column", will avoid a misconception when decimals are introduced later in the year.

Things to look out for

- When using concrete resources, children may make both numbers, then remove the second one, leaving the first number unchanged.
- Children may not line up the digits in the place value columns correctly, especially when the numbers have different numbers of digits.

Key questions

- How can you show this question using place value counters?
- What is ______ less than ______?
- Does it matter which column you subtract first?
- Do you need to make an exchange?
- Do you have enough ones/tens/hundreds to subtract ______?

Possible sentence stems

- ______ ones/tens/hundreds subtract ______ ones/tens/hundreds is equal to ______
- I can/cannot subtract ______ ones/tens/hundreds from ______ ones/tens/hundreds, so I do/do not need to make an exchange.

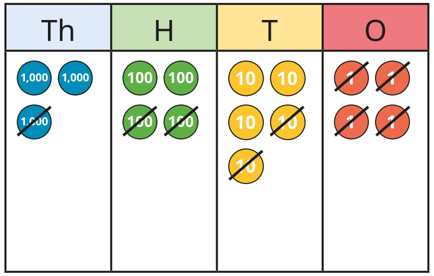
National Curriculum links

- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Subtract two 4-digit numbers – no exchange

Key learning

- Dora uses place value counters to work out 3,454 – 1,224

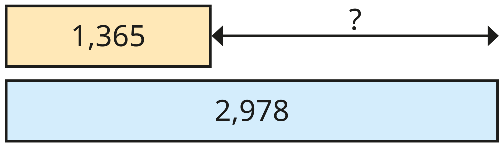


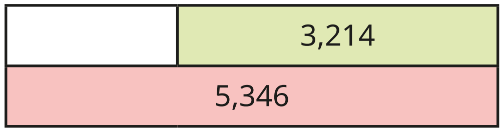
	Th	H	T	O
	3	4	5	4
–	1	2	2	4
	2	2	3	0

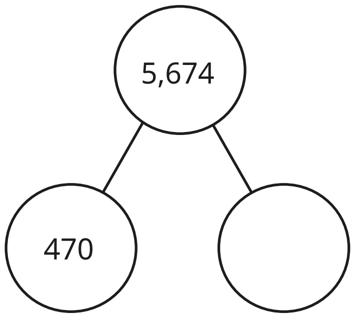
Use Dora's method to work out the subtractions.

4,572 – 2,341	7,462 – 7,151	6,582 – 582	2,348 – 235

- Find the missing numbers.







- Use bar models to help you answer each question.

There are 3,597 boys and girls in a school.
2,182 are boys.
How many girls are there?

Car A travels 7,653 miles per year.
Car B travels 5,612 miles per year.
How much further does car A travel than car B per year?

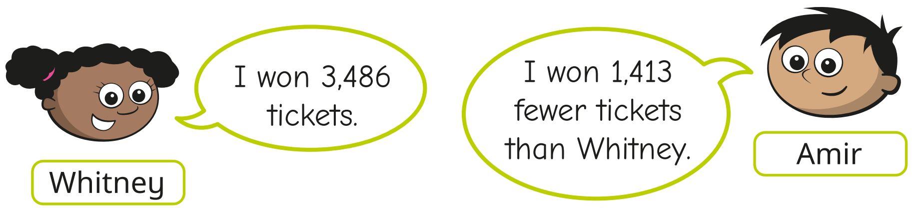
- The mass of a bag of sand is 3,576 g.

  1,250 g of sand is poured from the bag.

  What is the mass of the bag of sand now?

- Whitney and Amir are at the fair.

  At each stall, they can win tickets.



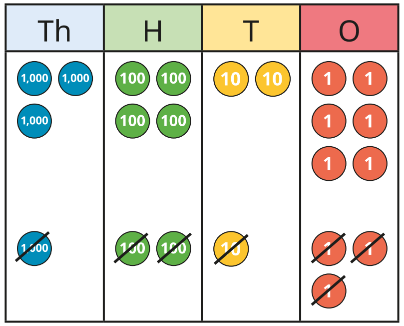
How many tickets did Amir win?

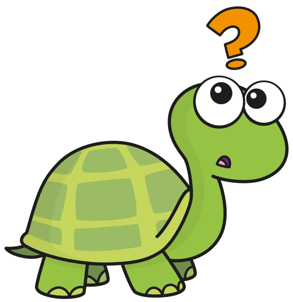
Subtract two 4-digit numbers – no exchange

Reasoning and problem solving

Tiny is working out 3,426 – 1,213 using place value counters.

Tiny keeps getting 3,426 as the answer.





Explain Tiny's mistake.

Work out the correct answer.

2,213

Fill in the missing digits.

	Th	H	T	O
	9	9	9	9
–			8	
		3		

Compare answers with a partner.

Can you find any more?

for example:

9,999 – **3,685** = **6,314**

9,999 – **1,680** = **8,319**

The mass of a box is 2,479 g.

A teddy bear is 1,305 g lighter than the box.

What is the total mass of the teddy bear and the box?

3,653 g

Subtract two 4-digit numbers – one exchange

Notes and guidance

Building on the previous small step, children subtract up to 4-digit numbers, with one exchange. In Year 3, children subtracted 2- and 3-digit numbers with up to two exchanges.

It is important that children complete the formal written method alongside any concrete manipulatives to support understanding.

Before subtracting each column, ask, "Do you have enough ones/tens/hundreds to subtract ______?" If not, then an exchange is needed.

For this small step, the exchange could take place from the tens, hundreds or thousands, but there is only one exchange per calculation.

Things to look out for

- Children may not line up the digits in the place value columns correctly, especially when the numbers have different numbers of digits.
- Children may find the difference between the two digits in a column instead of subtracting the second digit from the first in order to avoid an exchange, for example 1 – 3 becomes 3 – 1

Key questions

- What is ______ less than ______?
- Does it matter which column you subtract first?
- Do you need to make an exchange?
- How can you subtract two numbers if one of them has fewer digits than the other?

Possible sentence stems

- ______ ones/tens/hundreds subtract ______ ones/tens/hundreds is equal to ______
- I can/cannot subtract ______ ones/tens/hundreds from ______ ones/tens/hundreds, so I do/do not need to make an exchange.

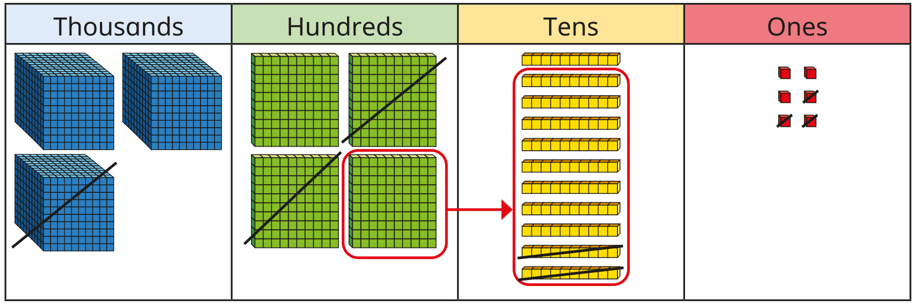
National Curriculum links

- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Subtract two 4-digit numbers – one exchange

Key learning

- Rosie uses base 10 to work out 3,416 – 1,223



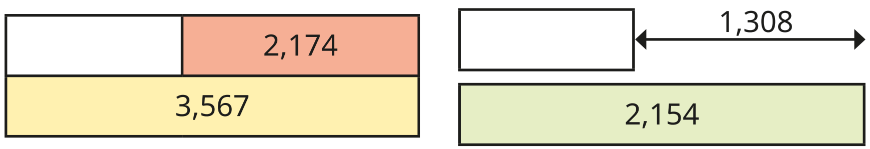
	Th	H	T	O
	3	³~~4~~	¹1	6
–	1	2	2	3
	2	1	9	3

Use Rosie's method to help you work out the subtractions.

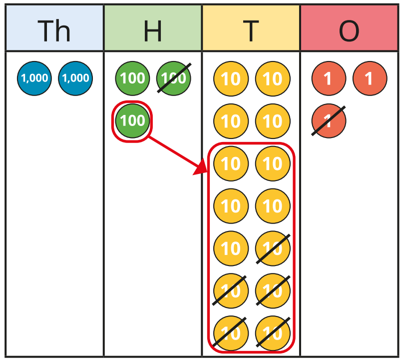
4,256 – 1,139 | 3,758 – 1,825 | 2,547 – 1,452

What is the same and what is different about these subtractions?

- Find the missing numbers.



- Ron uses place value counters to work out 2,343 – 151



	Th	H	T	O
	2	²~~3~~	¹4	3
–		1	5	1
	2	1	9	2

Use place value counters to help you work out the subtractions.

5,383 – 291 | 3,157 – 523 | 9,458 – 86

- Use bar models to help you complete the questions.

Mrs Trent has £3,544
She spends £1,225
How much money does she have left?

Mrs Khan has £1,745
She has £1,239 more than Mr Khan.
How much money does Mr Khan have?

Subtract two 4-digit numbers – one exchange

Reasoning and problem solving

1,235 people go on a school trip.

There are 1,179 children and 27 teachers.

The rest are parents.

How many parents are there?

Explain your method to a partner.

29 parents

Find the missing numbers.

______ – 1,345 = 4_6

What is the greatest number that could go in the first space?

What is the smallest?

How many possible answers could you have?

What is the pattern between the numbers?

What method did you use?

1,841 (and 9)

1,751 (and 0)

10 possible answers

For each answer, both numbers go up by 10

The subtraction has exactly one exchange.

	Th	H	T	O
	5	6	3	2
–				

What could the missing numbers be if the exchange is in the tens column?

What if the exchange was in another column?

Talk about it with a partner.

various possible answers, e.g.

2,351 and 3,281

various possible answers, e.g.

3,810 and 1,822

Subtract two 4-digit numbers – more than one exchange

Notes and guidance

In this small step, children subtract up to 4-digit numbers with more than one exchange, using the written method of column subtraction.

Children perform subtractions involving two separate exchanges (for example, from the thousands and from the tens) as well as those with two-part exchanges (for example, from the thousands down to the tens if there are no hundreds in the first number). To support understanding, continue solving these subtractions alongside the concrete resources of base 10 and place value counters.

When completing the written method, it is vital that children are careful with where they put the digits, especially those that have been exchanged. Two-part exchanges can be confusing for children if they are unsure what each digit represents or where to put it.

Things to look out for

- Children may not line up the digits in the place value columns correctly.
- When exchanging a number, children may put the 1 in the incorrect place.
- When exchanging over two columns, children may exchange directly from, for example, hundreds down to ones and miss out the exchange to tens.

Key questions

- Does it matter which column you subtract first?
- Do you need to make an exchange?
- How can you subtract two numbers if one of them has fewer digits than the other?
- If you cannot exchange from the tens/hundreds, what do you need to do?
- Which column can you exchange from?

Possible sentence stems

- ______ ones/tens/hundreds subtract ______ ones/tens/hundreds is equal to ______
- I can/cannot subtract ______ ones/tens/hundreds from ______ ones/tens/hundreds, so I do/do not need to make an exchange.

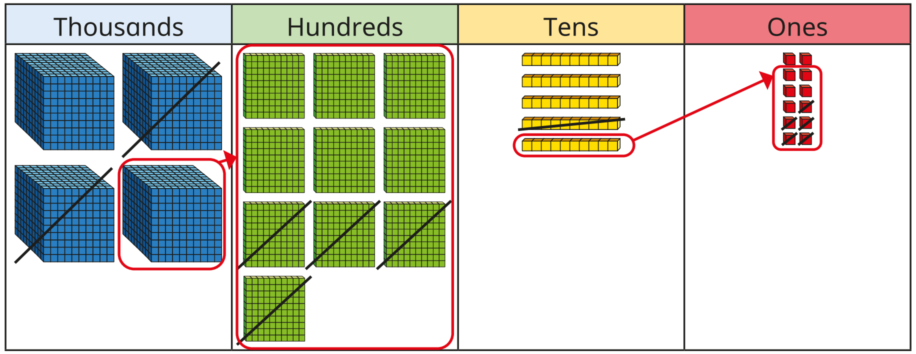
National Curriculum links

- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Subtract two 4-digit numbers – more than one exchange

Key learning

- Tommy uses base 10 to help him work out 4,052 – 2,415



	Th	H	T	O
	$^{3}\cancel{4}$	$^{1}0$	$^{4}\cancel{5}$	$^{1}2$
–	2	4	1	5
	1	6	3	7

Use Tommy's method to work out the subtractions.

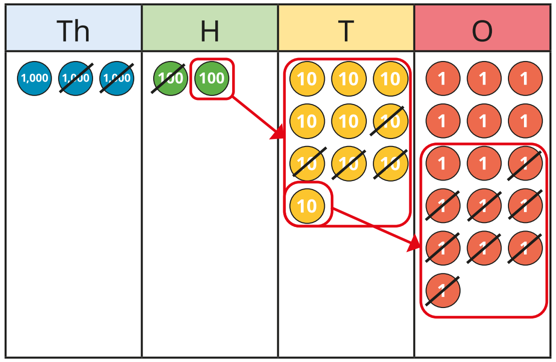
5,783 – 844 | 6,737 – 759 | 8,252 – 6,560

- Mr Jones paid £8,562 for his car.

  Mrs Smith paid £6,729 for her car.

  How much more did Mr Jones pay for his car than Mrs Smith paid for hers?

- Aisha works out 3,206 – 2,148 using place value counters.



	Th	H	T	O
	3	$^{1}\cancel{2}$	$^{9}\cancel{^{1}0}$	$^{1}6$
–	2	1	4	8
	1	0	5	8

Use Aisha's method to work out the subtractions.

2,356 – 1,427 | 1,205 – 398 | 2,037 – 889 | 2,037 – 1,589

- A shop has 8,435 magazines.

  It sells 367 in the morning and 579 in the afternoon.

  How many magazines are left?

8,435		
367	579	

Explain how you found the answer.

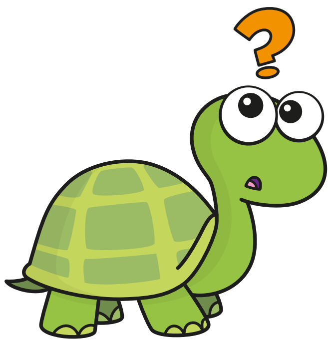
Is there more than one way to solve this problem?

Subtract two 4-digit numbers – more than one exchange

Reasoning and problem solving

Tiny has worked out 3,035 – 1,074

	Th	H	T	O
	$^{2}\not{3}$	0	$^{1}3$	5
–	1	0	7	4
	1	0	6	1



Do you agree with Tiny?

Explain your answer.

No

There were 2,114 visitors to a museum on Saturday.

650 more people visited the museum on Saturday than on Sunday.

Altogether, how many people visited the museum over the two days?

What do you need to do first to solve the problem?

3,578

Work out 2,114 – 650 for the number of visitors on Sunday.

Find the missing 4-digit number.

	Th	H	T	O
+	4	6	7	8
	7	4	3	1

How did you find the answer?

Is there more than one way?

2,753

Efficient subtraction

Notes and guidance

Having explored both mental and written methods of subtraction in this block, the purpose of this small step is to encourage children to make choices about which method is most appropriate for a given calculation. Children can often become reliant on formal written methods, so it is important to explicitly highlight where mental strategies or less formal jottings can be more efficient.

Children explore the concept of constant difference, where adding or subtracting the same amount to/from both numbers in a subtraction means that the difference remains the same, for example 2,832 – 1,999 = 2,833 – 2,000 or 400 – 193 = 399 – 192. This can help make potentially tricky subtractions with multiple exchanges much simpler, sometimes even becoming calculations that can be performed mentally. Number lines can support understanding of this concept.

Things to look out for

- Children may be overly reliant on formal written methods and use them when alternative strategies are more appropriate.
- Children may not adjust both numbers in the subtraction.

Key questions

- Which method do you find easiest? Why?
- Which method is most efficient?
- Can you work this out mentally?
- What does "difference" mean?
- What does the arrow represent? What do you notice about all the arrows?
- Why does adding/subtracting ______ to/from each number make the calculation easier?

Possible sentence stems

- The jump to the next multiple of ______ is ______
- If I add/subtract ______ to/from both numbers, the difference will be the same.

National Curriculum links

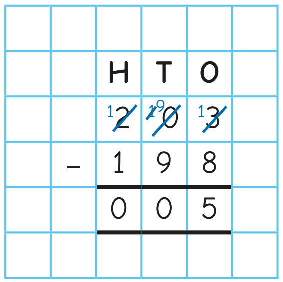
- Add and subtract numbers with up to four digits using the formal written methods of columnar addition and subtraction where appropriate

Efficient subtraction

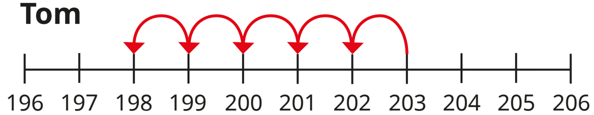
Key learning

- Kim, Tom and Huan are working out 203 – 198

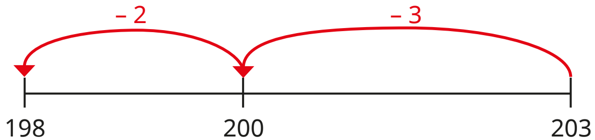
Kim



Tom



Huan



Whose method do you prefer? Why?

Which is the most efficient method?

Use your preferred method to complete the subtractions.

9,807 – 9,792	809 – 15	3,876 – 1,400	4,204 – 2,417

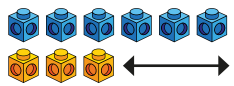
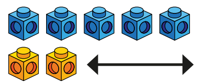
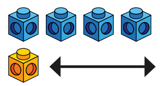
Did you use the same method each time?

- Complete each subtraction.

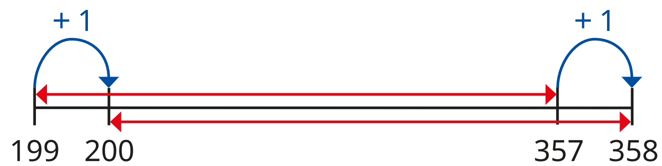
  What do you notice?

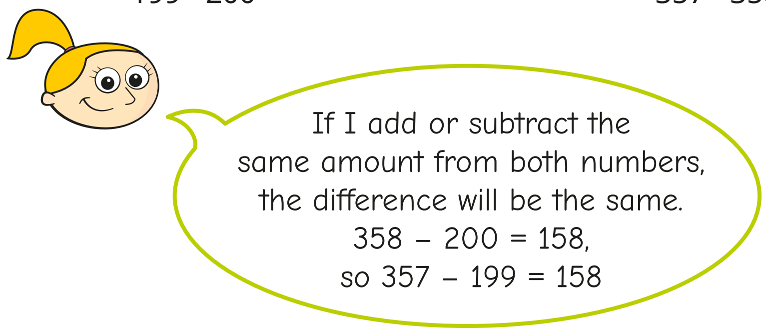
  What stays the same?

  What changes?

6 – 3 = ____	
5 – 2 = ____	
4 – 1 = ____	

- Eva is working out 357 – 199





Use Eva's method to work out the subtractions.

3,487 – 999	4,407 – 1,399	7,643 – 5,098

- Complete the subtractions.

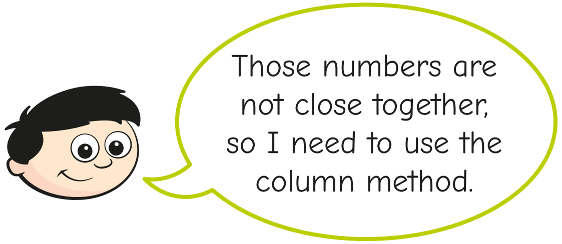
300 – 176	4,000 – 3,180	6,001 – 3,065

Compare methods with a partner.

Efficient subtraction

Reasoning and problem solving

Dexter is working out 4,387 – 134



	Th	H	T	O
	4	3	8	7
–		1	3	4

Do you agree with Dexter?

Explain your reasons.

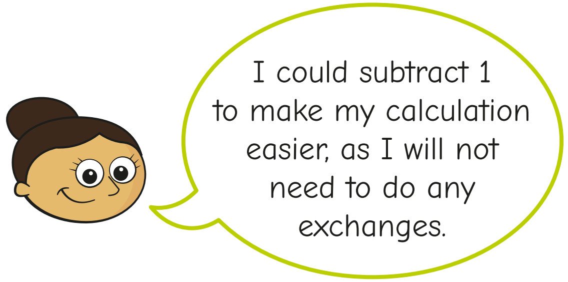
What other methods could Dexter use?

No

Dexter could have used a number line.

As there are no exchanges, he could have done the subtraction mentally.

Dora is working out 500 – 287



	H	T	O
	4	9	9
–	2	8	7
	2	1	2

What mistake has Dora made?

What is the correct answer?

How else could you work out 500 – 287?

Dora needed to subtract 1 from both numbers.

213

e.g. 499 – 287 = 212, 212 + 1 = 213
number lines

Estimate answers

Notes and guidance

In Year 3, children explored the idea of estimating without explicitly using the language of rounding. Now that children have covered rounding in Autumn Block 1, they are familiar with the language of "rounding to the nearest ______". In this small step, children estimate by rounding to the nearest ten, hundred and thousand. Number lines are a useful representation to support this understanding.

Discuss why estimates are important, particularly in real-life situations such as population statistics. They allow us to quickly and easily get an idea of what an answer should be near to or if an already calculated answer is appropriate. It is important to discuss whether an actual answer will be greater or less than an estimate. For example, 333 + 524 may be estimated as 300 + 500, and the precise answer will be greater than the estimate because both the numbers were rounded to the previous multiple.

Things to look out for

- Children may find it difficult to decide which multiple to round to.
- Children may find it difficult to work out whether an estimate will be greater or less than the actual answer.

Key questions

- What multiple of 10/100/1,000 comes before and after ______?
- Where would ______ be on this number line?
- Which multiple is ______ closer to?
- Which calculation is easier/quicker to perform? Why?
- Why do we use estimates?
- Is the estimate less than or greater than the actual answer? Why?

Possible sentence stems

- ______ is closer to ______ than ______
- So ______ rounded to the nearest ______ is ______
- The estimate will be ______ than the actual answer because …

National Curriculum links

- Estimate and use inverse operations to check answers to a calculation

Estimate answers

Key learning

- Use the number lines to help you complete the sentences.

1,880 rounded to the nearest thousand is ______

3,341 rounded to the nearest thousand is ______

Use the rounded amounts to estimate 3,341 – 1,880

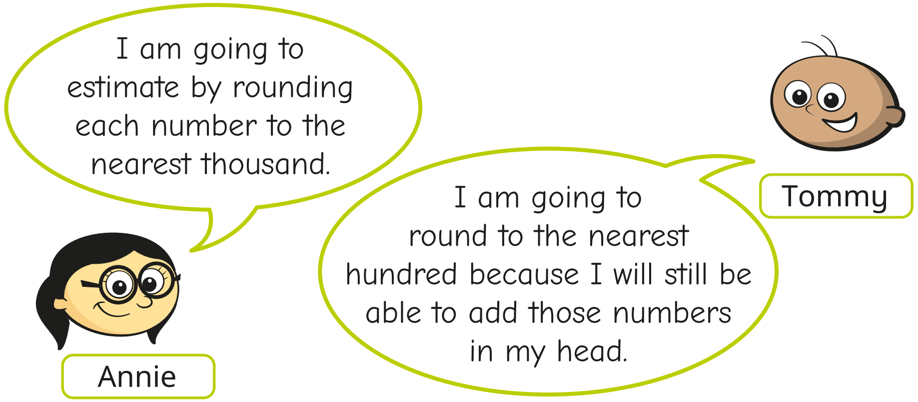
Use column subtraction to work out the actual answer.

- Write < or > to complete the statements.

436 ◯ 400	327 + 436 ◯ 327 + 400
3,838 ◯ 4,000	8,000 – 3,838 ◯ 8,000 – 4,000
1,132 ◯ 1,100	4,000 – 1,132 ◯ 400 – 1,100

What do you notice?

- Annie and Tommy are estimating the answer to 3,219 + 5,624



Use Annie and Tommy's methods to estimate the answer.

Now work out the actual answer using column addition.

Whose estimate was more accurate? Why?

- Mrs Lee has £5,000 in her bank account.

A TV costs £1,328

A car costs £3,889

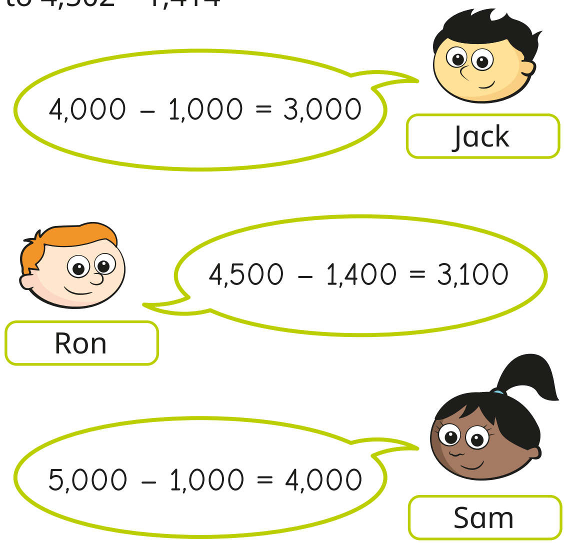
Estimate whether Mrs Lee can afford to buy both the television and the car.

Does your answer change if you round to a different amount?

Estimate answers

Reasoning and problem solving

The children are estimating the answer to 4,502 – 1,414



Which children have rounded correctly?

What mistake has been made?

Whose calculation was easiest?

Whose estimate was most accurate?

Ron and Sam

Sam's

Ron's

The estimated answer to a calculation is 3,400

The numbers in the calculation were rounded to the nearest hundred for the estimate.

What could the original calculation be?

multiple possible answers, e.g.

2,343 + 1,089

4,730 – 1,304

Roll a 6-sided dice eight times.

Write each number in one of the boxes.

Now work out your addition.

	Th	H	T	O
+				

Compete against a partner. Who can get an answer closest to 5,000?

Compare answers as a class.

Checking strategies

Notes and guidance

In this small step, children explore the inverse relationship between addition and subtraction. From learning in earlier years, children know that addition and subtraction are inverse operations and they should also be aware that addition is commutative and subtraction is not.

Bar models and part-whole models are useful representations to help establish families of facts that can be found from one calculation. Children use inverse operations to check the accuracy of their calculations, rather than simply redoing the same calculation and potentially repeating the same error.

Estimations can be used alongside inverse operations as an alternative checking strategy.

Things to look out for

- Children may subtract a part from a part rather than a part from the whole, for example writing 240 – 130 as the inverse of 240 + 130
- When asked to check an answer, children may just repeat the same calculation instead of using the inverse operation.

Key questions

- What are the parts? What is the whole?
- Given one fact, what other facts can you write?
- What does "inverse" mean?
- What is the inverse of add/subtract ______?
- Is addition/subtraction commutative?

Possible sentence stems

- The inverse of ______ is ______
- If ______ is a part and ______ is a part, then ______ is the whole.
- If ______ is the whole and ______ is a part, then ______ is the other part.
- To check I have added/subtracted ______ correctly, I need to ______

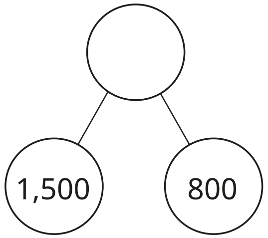
National Curriculum links

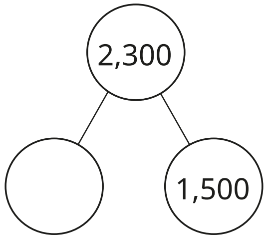
- Estimate and use inverse operations to check answers to a calculation

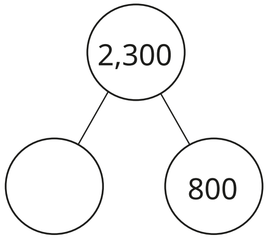
Checking strategies

Key learning

- Complete the part-whole models and number sentences.



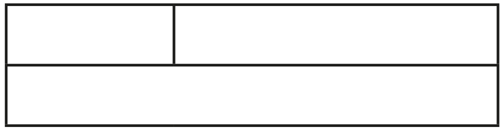




1,500 + 800 = ______ | 2,300 – 1,500 = ______ | 2,300 – 800 = ______

How could you check your answers?

- Complete the bar model for 3,582 – 2,236 = 1,346



Use the bar model to write the fact family.

- Which subtractions can be used to check the addition 1,574 + 3,432 = 5,006?

5,006 – 3,432 | 5,006 – 1,574 | 3,432 – 1,574 | 1,574 – 5,006

- Which additions can be used to check the subtraction 3,265 – 823 = 2,442?

3,265 + 823 | 823 + 2,442 | 3,265 + 2,442 | 2,442 + 823

- Use an inverse operation to check each calculation.

How many different inverse calculations can you do for each?

	Th	H	T	O
	4	5	1	9
+		7	2	3
	5	2	4	2
	1		1	

	Th	H	T	O
	3	~~5~~ 4	1 6	4
–	1	4	8	4
	2	0	8	0

- Dani has answered a problem.

> Mr Rose has £2,358 in his bank account.
> He spends £1,209 on a family holiday.
> How much does he have left? £ 1,049

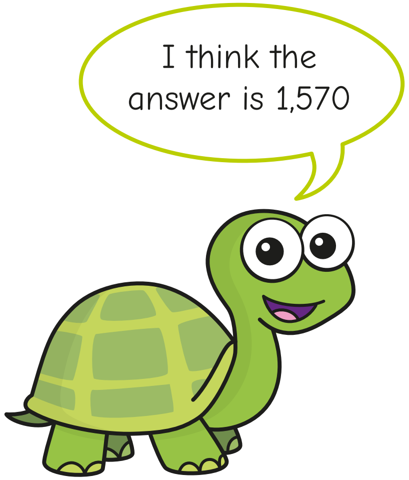
Estimate to check Dani's answer.

Now use an inverse calculation to check if Dani's answer is correct.

Checking strategies

Reasoning and problem solving

627 + ☐ = 943



Show by estimating that Tiny has made a mistake.

What mistake has Tiny made?

Find the correct answer.

Complete an inverse operation to check your answer.

various possible estimates, e.g.

600 + 300 = 900

900 – 600 = 300

627 + **316** = 943

Tiny is completing some statements.

Check Tiny's answers.

Do you need to work out the answers or can an estimate help you decide whether Tiny is correct?

55 + 28 = [70] – 13

55 – 28 = 13 + [40]

28 + [12] > 55 – 13

28 + 13 < 55 – [96]

Find the correct answers.

Is there more than one possible answer for any of the statements?

Compare strategies as a class.

96

14

any number greater than 14

any number between 0 and 13

Autumn Block 3

Area

Small steps

Step 1	What is area?
Step 2	Count squares
Step 3	Make shapes
Step 4	Compare areas

What is area?

Notes and guidance

In this small step, children encounter area for the first time.

They learn that area is the amount of space taken up by a two-dimensional shape or surface. They explore different ways of working out the area of a shape, and it is important that children recognise that some ways are better than others. In this small step, area is found by practically counting squares and not through any formal calculations.

This topic lends itself to practical activities such as finding the area of classroom objects using square pieces of paper. Activities such as this can be extended by using different-sized squares and discussing why this gives a different answer.

Children also explore the idea that counters are not suitable for finding area, as the whole area cannot be covered.

Things to look out for

- When investigating area for the first time, children may not use a reliable method or unit to count how much space is taken up.
- When using sticky notes to practically investigate area, children may overlap them. This is a good opportunity to discuss the importance of measuring accurately.

Key questions

- How can you measure area?
- Which item has the greatest/smallest area?
- Why would you not use sticky notes to find the area of the playground? What could you use instead?
- Why are sticky notes not useful for finding the area of a circle?
- What do you think the area of ______ might be?
- What happens if you use a different unit of measure to find the area?

Possible sentence stems

- The area of ______ is ______
- Area is the amount of ______ taken up by a 2-D shape or surface.
- Area can be measured using ______

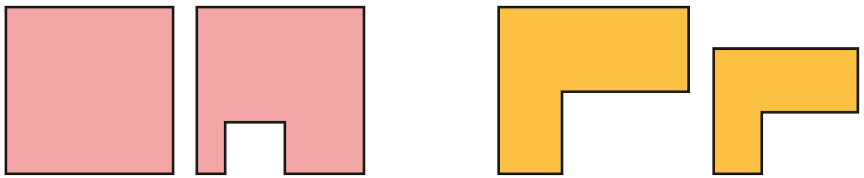
National Curriculum links

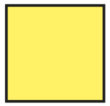
- Find the area of rectilinear shapes by counting squares

What is area?

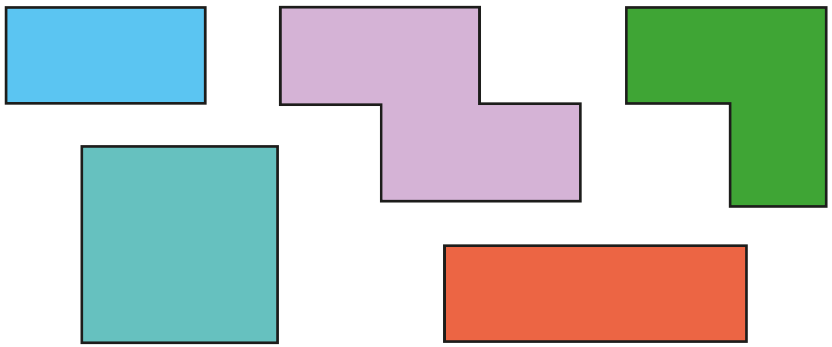
Key learning

- For each pair of shapes, tick the shape with the greater area.



- This is a square sticky note. 

  Estimate how many sticky notes you need to make these shapes.



  Use five sticky notes to make as many different shapes as possible.

  Compare shapes with a partner.

  Explain how you know that all the shapes have the same area.

- Make a shape with an area of 3 sticky notes.

  Make a shape with an area of 8 sticky notes.

  Make a shape with an area of 6 sticky notes.

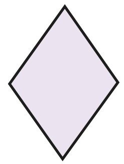
  Which shape has the greatest area?

  How do you know?

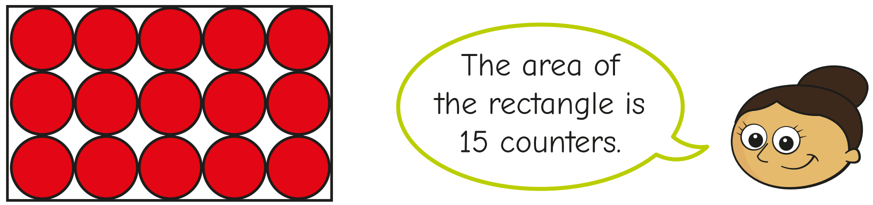
- Here is a rhombus.

  Draw a rhombus with a smaller area.

  Draw a rhombus with a greater area.



- Dora is using counters to find the area of the rectangle.



  Do you agree with Dora?

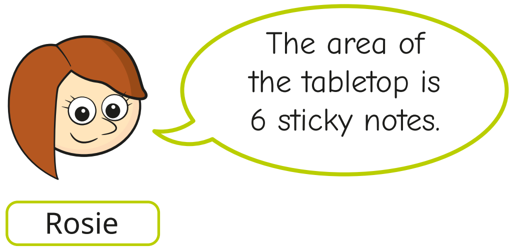
  Talk about it with a partner.

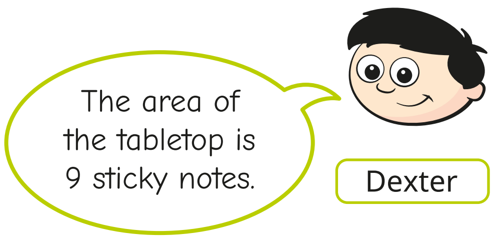
What is area?

Reasoning and problem solving

Rosie and Dexter each find the area of the same table.

They use different-sized sticky notes.



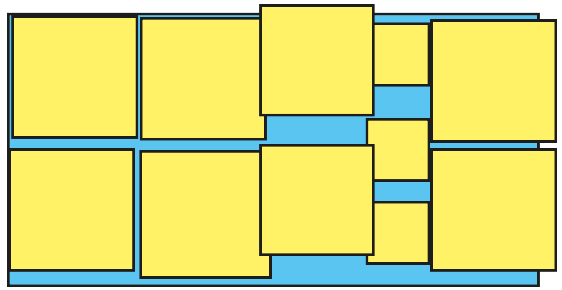


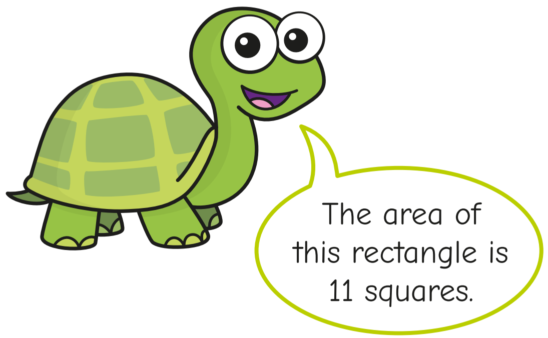
Who has the larger sticky notes?

How do you know?

Rosie

Tiny is finding the area of a rectangle.





What mistakes has Tiny made?

Talk about it with a partner.

Some of the squares overlap.

There are different-sized squares.

Some of the squares extend beyond the shape.

Count squares

Notes and guidance

In the previous small step, children learnt that area is the space taken up by a two-dimensional shape or surface, and measured it practically. In this small step, they use the strategy of counting the number of squares inside a shape to find its area.

If appropriate, children can move on to finding the areas of shapes that include half squares. Marking or noting which squares they have already counted supports children's accuracy when finding the area of complex shapes.

Using arrays relating to area can be explored, but children are not expected to recognise the formula. Knowledge of the properties of squares and rectangles can help children to find the areas of shapes with parts missing.

Things to look out for

- Children may miscount when counting the squares of more complex shapes.
- If children are insecure with their times-tables, they may make mistakes when using arrays to find the area.
- After using arrays to find the area of a rectangle, children may use them to find the areas of all shapes, which may not be appropriate.

Key questions

- What can you do to make sure you do not count a square twice?
- How can you make sure you do not miss a square?
- Does your knowledge of times-tables help you to find the area?
- Can you use arrays to find the area of any shape?
- Which method is easier? Why?
- What can you do if the squares are not full squares?

Possible sentence stems

- There are ______ squares inside the shape.
  This means that the area of the shape is ______ squares.
- There are ______ squares and ______ half squares inside the shape.
  This means that the area of the shape is ______ squares.
- There are ______ rows. Each row has ______ squares.
  There are ______ squares in total.

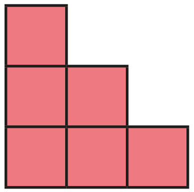
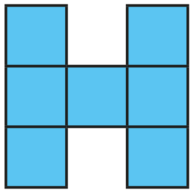
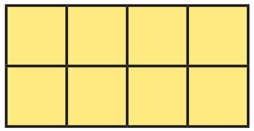
National Curriculum links

- Find the area of rectilinear shapes by counting squares

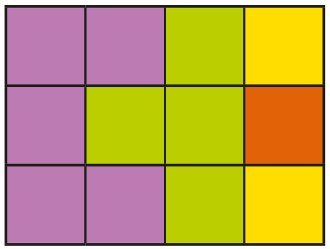
Count squares

Key learning

- Count the squares to find the area of each shape.

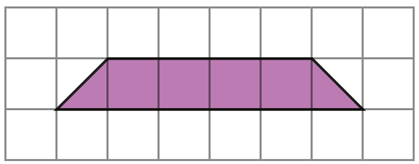
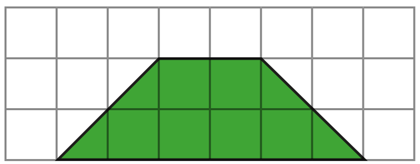
- Here is a patchwork quilt made from different-coloured squares.



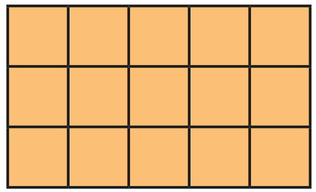
Find the area of each colour.

What is the total area of the quilt?

- What is the area of each shape?

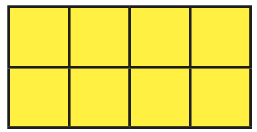



- Tiny uses times-tables to work out the area of the rectangle.



There are 3 rows altogether.
There are 5 squares in a row.
3 rows of 5 squares = 15 squares
The area of the shape is 15 squares.

Use Tiny's method to work out the area of this rectangle.



Complete the sentences.

There are ______ rows altogether.

There are ______ squares in a row.

______ rows of ______ squares = ______ squares

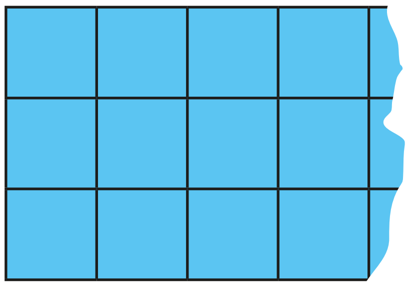
The area of the shape is ______ squares.

Count squares

Reasoning and problem solving

A rectangle is made from squares.

The end of the rectangle has been torn off.



What is the smallest possible area of the original rectangle?

What other possible areas could there be?

Talk about it with a partner.

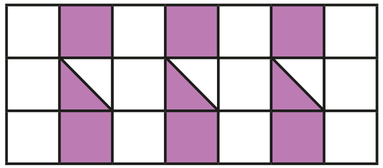
5 × 3 = 15 squares

---

multiple possible answers, e.g. 18, 21, 24

There are 3 rows, so all answers must be divisible by 3

Mrs Trent is tiling her kitchen with this design.



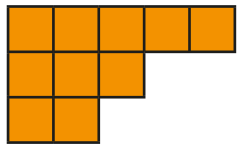
She has 5 white tiles and $2\frac{1}{2}$ purple tiles.

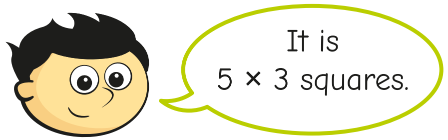
How many more white and purple tiles will she need?

$8\frac{1}{2}$ white tiles

5 purple tiles

Jack thinks that the area of this shape is 15 squares.





What mistake has Jack made?

The shape is not a complete rectangle.

Make shapes

Notes and guidance

In this small step, children make rectilinear shapes using a given number of squares.

Children learn that a rectilinear shape is a shape that has only straight sides and right angles. They explore the idea that rectilinear shapes need to touch at the sides and not just at the corners. Children may notice that a rectilinear shape looks like two rectangles joined together, but should be careful not to calculate the area as two rectangles added together, as this will sometimes include an overlap.

Children should work systematically to find all the different rectilinear shapes using a given number of squares by moving one square at a time, before moving on to drawing their own shapes with a given area.

Things to look out for

- Children may not know that rectilinear shapes need to be touching along the sides, not just at the corners.
- When making rectilinear shapes with concrete resources, children may overlap the squares.
- Children may not recognise that shapes can look different but have the same area.

Key questions

- How many different shapes can you make with four squares?
- How can you work systematically?
- Should you overlap the squares when making your shapes?
- How many of these shapes are rectilinear? Explain why.
- Is it possible to make a rectangle with an odd number of squares?
- Is it possible to make a square with an odd number of squares?

Possible sentence stems

- There are ______ squares inside the shape.
  This means that the area of the shape is ______ squares.
- The area of the shape is ______ squares.
- I can make the shape different by ______

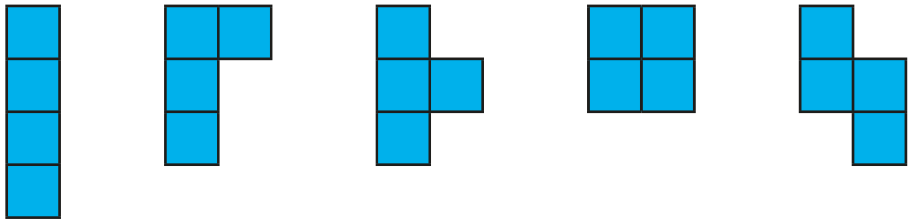
National Curriculum links

- Find the area of rectilinear shapes by counting squares

Make shapes

Key learning

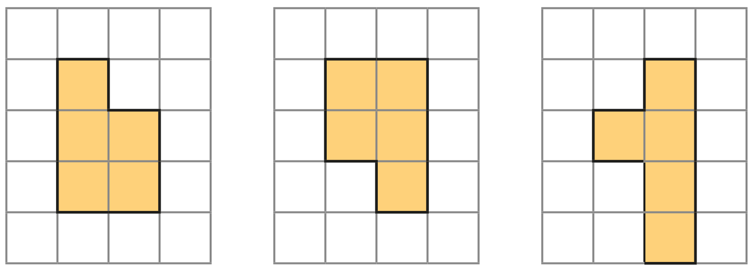
- Ron has used four squares to make different rectilinear shapes.



Use four squares to continue to make different rectilinear shapes.

How can you work systematically?

- Here are some rectilinear shapes.



Find the area of each shape.

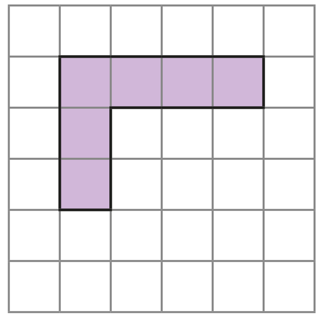
What do you notice?

Talk about it with a partner.

- Draw three rectilinear shapes, all with an area of 8 squares.

What is the same about each shape? What is different?

- Shade more squares to make the area of the shape 12 squares.



Compare answers with a partner.

What do you notice?

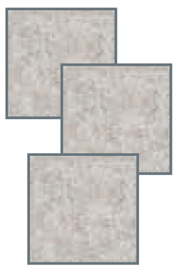
- A builder uses 20 square slabs to make a patio.

Draw a plan of the patio on a squared grid.

The builder paints 6 of the square slabs green.

None of the green slabs are touching each other.

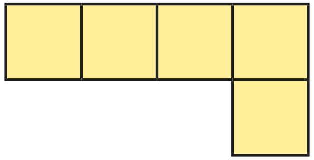
Colour the green slabs on your plan.



Make shapes

Reasoning and problem solving

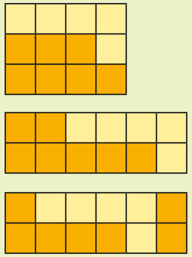
Here is a rectilinear shape.



Add 7 more squares to the shape to make a rectangle.

Is there more than one possible answer?

multiple possible answers, e.g.



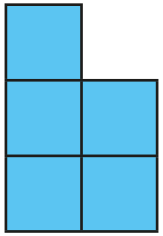
Is the statement true or false?

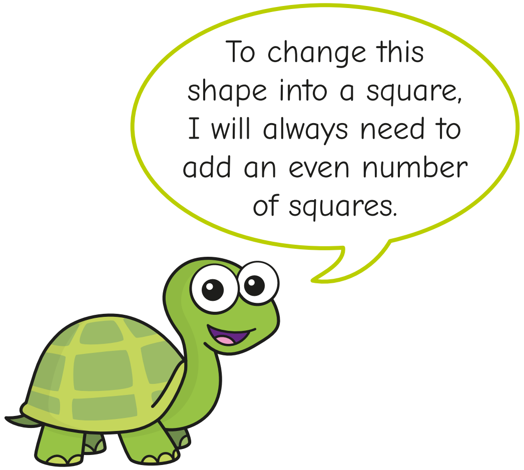
> There is only one possible way to make a rectangle with an area of 12 squares.

Draw a picture to support your answer.

False

Here is a shape.



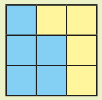


Do you agree with Tiny?

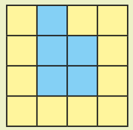
Explain your reasoning.

No

multiple possible answers, e.g.



+ 4



+ 11

Compare areas

Notes and guidance

Building on previous steps, children compare the areas of rectilinear shapes where the same size square has been used.

Marking or noting which squares they have already counted will support children's accuracy when finding the area of complex shapes.

Children begin by using the symbols <, > and = to compare the areas of different shapes, before drawing their own shapes to satisfy an inequality. They also compare the areas of different shapes and put them in size order.

Children could move on to finding the area of shapes that include half squares. This is another opportunity for children to explore the most efficient method for finding the area.

Things to look out for

- Children may not be confident using > and < for inequalities.
- Children may miscount when counting the squares of more complex shapes.
- When counting squares to find the area of rectilinear shapes, children may count some squares more than once, which will give them an incorrect area.

Key questions

- How can you find out which shape has the greater area?
- How much greater/smaller is the area of the first/second shape?
- What is different about the numbers of squares covered by the two shapes?
- What is the difference in area between the shapes?
- How can you order the shapes?

Possible sentence stems

- The area of shape A is ______ squares and the area of shape B is ______ squares.
- I know shape ______ has a greater area because it has ______ more squares than shape ______
- The more squares inside a shape, the ______ the area.

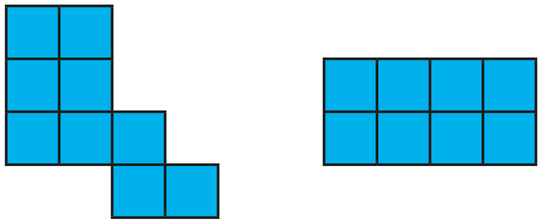
National Curriculum links

- Find the area of rectilinear shapes by counting squares

Compare areas

Key learning

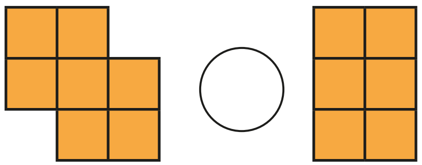
- Which shape has the smaller area?



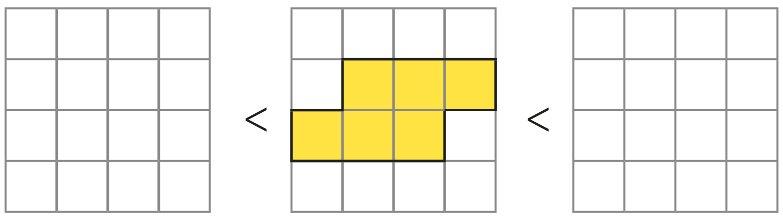
How did you find your answer?

Talk to a partner.

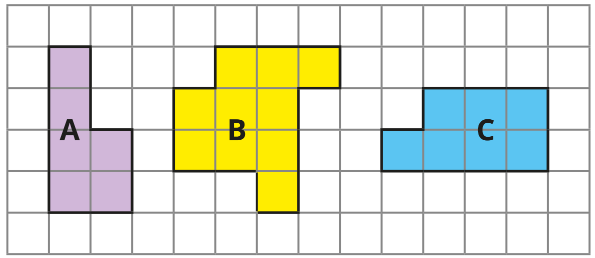
- Write <, > or = to compare the areas of the shapes.



- Draw two shapes to complete the comparison.

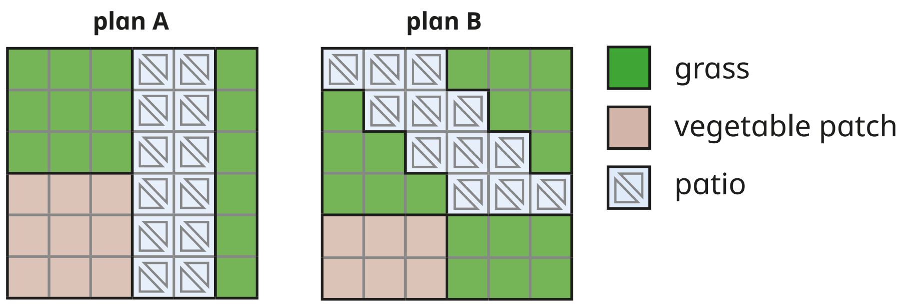


- Put the shapes in order of size starting with the smallest area.



- A gardener has made two plans for a garden.

  Each plan has grass, a vegetable patch and a patio.



  - What is the difference in the areas of the vegetable patches?
  - Which plan uses more patio squares?
  - The gardener draws another plan and calls it plan C.

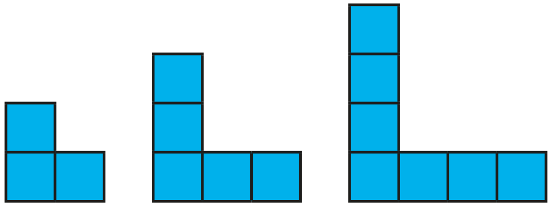
    The patio in plan C is twice the size of the patio in plan A.

    What is the area of the patio in plan C?

Compare areas

Reasoning and problem solving

Find the areas of the shapes.

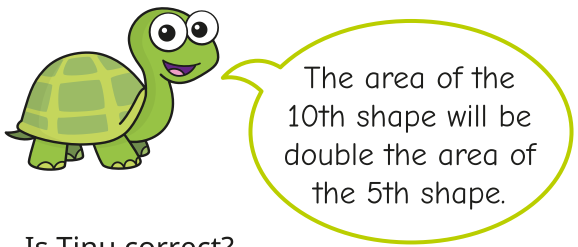


How is the area changing each time?

Draw the next shape in the pattern.

What is its area?

Work out the area of the 6th shape.

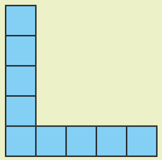


Is Tiny correct?

Talk about it with a partner.

3, 5, 7 squares

The area increases by 2 squares each time.

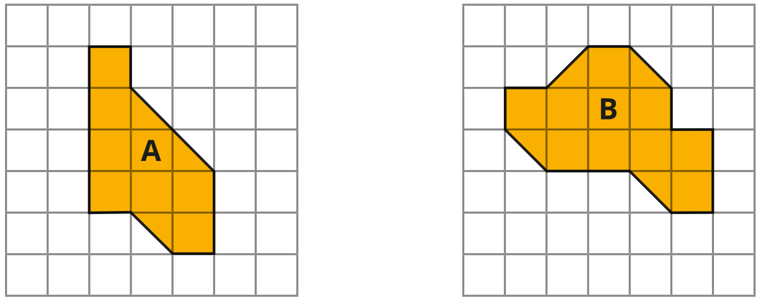


area = 9 squares

13 squares

No

Here are two shapes.



Scott draws another shape and labels it C.

- the area of shape A < the area of shape C
- the area of shape B > the area of shape C

Draw Scott's shape.

Is there more than one answer?

What could the area of his shape be?

multiple possible answers, e.g.

10, $10\frac{1}{2}$, 11, $11\frac{1}{2}$ squares

Autumn Block 4

Multiplication and division A

Small steps

Step 1	Multiples of 3
Step 2	Multiply and divide by 6
Step 3	6 times-table and division facts
Step 4	Multiply and divide by 9
Step 5	9 times-table and division facts
Step 6	The 3, 6 and 9 times-tables
Step 7	Multiply and divide by 7
Step 8	7 times-table and division facts

Small steps

Step 9	11 times-table and division facts
Step 10	12 times-table and division facts
Step 11	Multiply by 1 and 0
Step 12	Divide a number by 1 and itself
Step 13	Multiply three numbers

Multiples of 3

Notes and guidance

This small step revisits learning from Year 3 around multiplying by 3 and the 3 times-table.

Children explore the link between counting in 3s and the 3 times-table to understand multiples of 3 in a range of contexts. They use familiar representations such as number tracks and hundred squares to represent multiples of 3. They explore how to recognise if a number is a multiple of 3 by finding its digit sum: if the sum of the digits of a number is a multiple of 3, then the number itself is also a multiple of 3

This small step includes multiples of 3 up to 3 × 12 and will be useful support for learning multiples of 6 and 9 in future steps.

Things to look out for

- Children may think that any number with 3 ones is a multiple of 3
- An early mistake when counting in 3s will affect all subsequent multiples.
- Children may always begin counting from 3 to find a larger multiple of 3, when they could use the multiples they already know to find the new information.

Key questions

- What is the next multiple of 3?
- What is the multiple of 3 before ______?
- How many 3s are there in ______?
- How do you find the digit sum of a number?
- How can you tell if a number is a multiple of 3?
- Are the multiples of 3 odd or even?

Possible sentence stems

- The next multiple of 3 is ______
- The multiple of 3 before ______ is ______
- I know ______ is a multiple of 3 because …

National Curriculum links

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

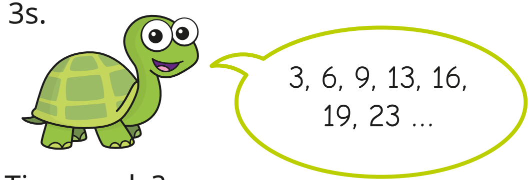
Multiples of 3

Key learning

- Complete the number track.

3	6		12		18	21	24			33	36

- Tiny is counting in 3s.



What mistake has Tiny made?

- Colour the multiples of 3 in the hundred square.

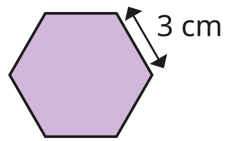
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

What do you notice?

- Complete the statements.
  - 3 lots of 3 = ______
  - 4 lots of 3 = ______
  - 5 lots of 3 = ______
  - 10 lots of 3 = ______
  - 4 lots of 3 and 2 lots of 3 = ______ lots of 3
  - 7 lots of 3 = ______ lots of 3 and 5 lots of 3

- Each side of a regular hexagon measures 3 cm.

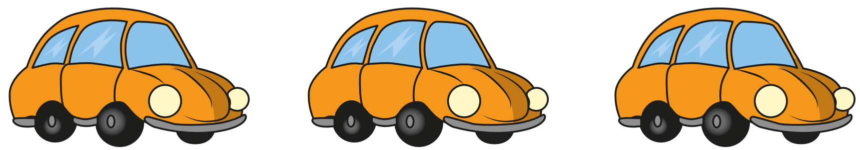
  What is the perimeter of the shape?



- 3 cars each have 3 people inside.

  Each person has 3 bags.

  How many bags are there altogether?



Multiples of 3

Reasoning and problem solving

Here are some multiples of 3

462	717	897	612	900	561

Find the digit sum of each number.

What do you notice?

Use what you have learned about adding digits together to find which of the numbers are multiples of 3

471	418	393
297	156	206

12, 15, 24, 9, 9, 12

471, 393, 297, 156

Scott has 3 times as much money as Kim.

Kim has 3 times as much money as Amir.

Kim has £12

How much money do Scott and Amir each have?

Scott: £36

Amir: £4

Bags of sweets cost £3

- Ron buys 3 bags.
- Dani buys 9 bags.
- Aisha buys 4 bags.

How much does each person spend?

How much more does Dani spend than Aisha?

How much do the children spend in total?

Ron: £9

Dani: £27

Aisha: £12

£15 more

£48 altogether

Multiply and divide by 6

Notes and guidance

In this small step, children build on their knowledge of the 3 times-table to explore the 6 times-table. The step aims to embed the children's fluency skills with the 6 times-table, while also providing them with strategies to use the multiplication facts they know to find unknown facts.

Children explore the fact that the 6 times-table is double the 3 times-table. Children who are confident in their times-tables can also explore the link between the 5 and 6 times-tables. They use the fact that multiplication is commutative to derive values for the 6 times-tables. This is developed further with division facts, where children explore fact families to embed their understanding of division as the inverse of multiplication.

Things to look out for

- Children may always start at 1 × 6 = 6 and recite the times-table, rather than use the number facts they know to find the facts they are not as secure with.
- When writing fact families, children may follow the pattern from multiplication and see division as commutative, for example writing 42 ÷ 6 = 7 so 6 ÷ 42 = 7
- Children may not recognise that when they are dividing by a greater number they get a smaller answer.

Key questions

- How many equal groups do you have?
  How many are there in each group?
  How many are there altogether?
- What does each number in the calculation represent?
- What does commutative mean?
- Is multiplication/division commutative?
- How can you use facts from the 3 times-table to work out facts from the 6 times-table?

Possible sentence stems

- 6 lots of ______ is ______
- ______ shared into 6 equal groups is ______
- Multiplying by 6 is the same as multiplying by ______ twice.
- ______ × 6 = double ______ × 3

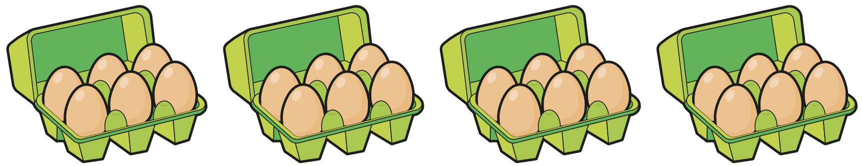
National Curriculum links

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

Multiply and divide by 6

Key learning

- Complete the sentences.

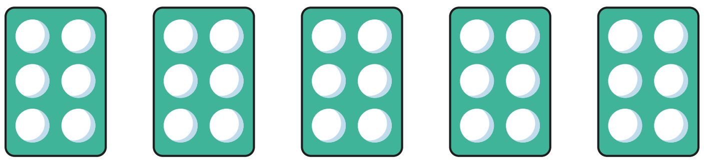


There are ______ boxes.

Each box contains ______ eggs.

There are ______ eggs in total.

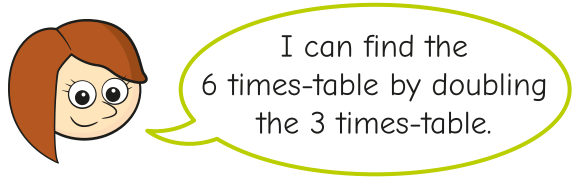
______ × ______ = ______

- 

Complete the fact family.

______ × ______ = ______ ______ ÷ ______ = ______

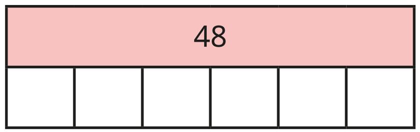
______ × ______ = ______ ______ ÷ ______ = ______

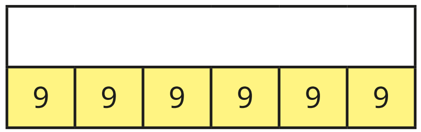
- 

Use Rosie's method to complete the sentences.

- ▶ 3 × 6 = double 3 × 3 = double 9 = 18
- ▶ 4 × 6 = double 4 × ______ = ______ = ______
- ▶ 5 × 6 = double ______ × ______ = ______ = ______
- ▶ 7 × 6 = double ______ × ______ = ______ = ______

- Complete the bar models.





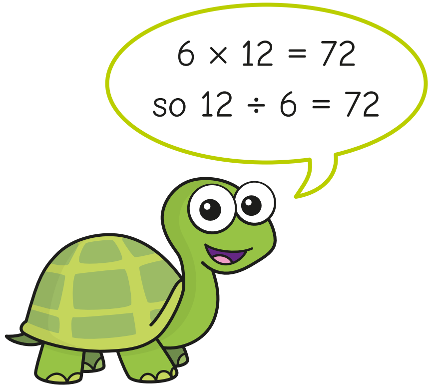
Write the fact families for each bar model.

- Which numbers can be divided into equal groups of 6?

24	18	48	60
9	56	72	38

Multiply and divide by 6

Reasoning and problem solving



Is Tiny correct?

Explain your answer.

No

Draw a bar model to represent each problem.

Tom has 54 cakes.

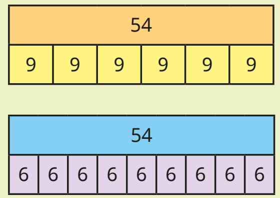
He shares them equally into 6 boxes.

How many cakes will go in each box?

Tom puts 54 cakes into boxes.

There are 6 cakes in each box.

How many boxes will he need?



Dora puts 72 pencils into pots.

She puts 6 pencils into each pot.

She shares the pots equally between 6 tables.

How many pots does she put on each table?

2

Is the statement true or false?

Sharing an amount into 6 equal groups will give twice as many in each group as sharing the same amount into 3 equal groups.

Explain your answer.

False

6 times-table and division facts

Notes and guidance

Building on the previous step, children use known facts to become more fluent in using the 6 times-table.

As in the previous step, they apply knowledge of the 3 times-table and understand that each multiple of 6 is double the corresponding multiple of 3

Children use their knowledge of other times-tables to find values for the 6 times-table, for example finding that 6 × 7 = 42 because 5 × 7 = 35 and 1 × 7 = 7, so 35 + 7 = 42

It is important that children practise the related division facts as well as the multiplication facts associated with the 6 times-table. Fluency with the 6 times-table will also help children to work out the 12 times-table in future steps.

Things to look out for

- Children may confuse different terminology to describe multiplication and division such as “equal groups”, “lots of”, “times”, “multiple” and so on.
- An early mistake when counting in 6s will affect all subsequent multiples.
- Children may not see the link between 6 × ______ and other multiples such as 5 × ______ and 1 × ______

Key questions

- How can you use facts from the 3 times-table to work out facts in the 6 times-table?
- How can you use facts from the 5 times-table to work out facts in the 6 times-table?
- If you know a multiplication sentence, what division sentences can you find?
- What is the fact family for the calculation?

Possible sentence stems

- 6 multiplied by ______ is equal to ______
- ______ × 6 = double ______ × 3
- ______ × 6 = ______ × 5 + ______
- ______ × 6 = ______, so ______ ÷ 6 = ______

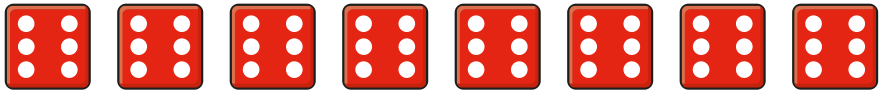
National Curriculum links

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

6 times-table and division facts

Key learning

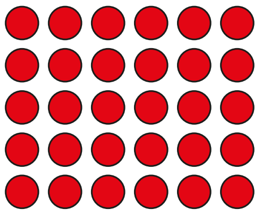
- Write a multiplication fact to work out the total.



______ × ______ = ______

What other multiplication and division facts can you find?

- Complete the fact family to match the array.



______ × ______ = ______

______ × ______ = ______

______ ÷ ______ = ______

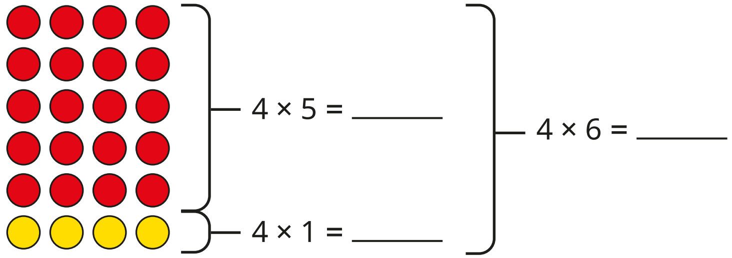
______ ÷ ______ = ______

- Complete the number sentences.

  - 1 × 3 = ______   1 × ______ = 6
  - 2 × ______ = 6   2 × 6 = ______
  - 3 × 3 = ______   3 × 6 = ______

  Write the next two sentences in the pattern.

- Use the array to complete the number sentences.



Use this method to complete the number sentences.

  - 2 × 5 = ______ and 2 × 1 = ______ so 2 × 6 = ______
  - 3 × 5 = ______ and 3 × 1 = ______ so 3 × 6 = ______
  - 7 × 5 = ______ and 7 × 1 = ______ so 7 × 6 = ______

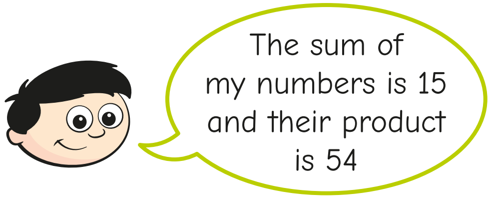
- Match the inverse operations.

7 × 6 = 42	18 ÷ 6 = 3
3 × 6 = 18	72 ÷ 6 = 12
9 × 6 = 54	54 ÷ 6 = 9
12 × 6 = 72	42 ÷ 6 = 7

6 times-table and division facts

Reasoning and problem solving

Dexter is thinking of two numbers.



What are Dexter's numbers?

Explain your answer.

Think of your own problem like this for a partner to solve.

6 and 9

Is the statement true or false?

All multiples of 3 are multiples of 6

Explain your answer.

False

Here are some facts about multiples of 3 and 6

If an even number has a digit sum that is a multiple of 3, then the number is a multiple of 3 and 6

If an odd number has a digit sum that is a multiple of 3, then it is a multiple of 3 but not of 6

195 | 15 | 624 | 592 | 128 | 348

Multiple of 3 only	Multiple of 3 and 6	Not a multiple of 3 or 6

multiple of 3 only: 195, 15

multiple of 3 and 6: 624, 348

not a multiple of 3 or 6: 592, 128

Multiply and divide by 9

Notes and guidance

In this small step, children are introduced to the 9 times-table. They use a range of strategies to support their fluency, such as looking for number patterns and finding unknown number facts from known facts, for example subtracting from the 10 times-table or tripling the 3 times-table, and these will be built upon later in the block.

Children explore the structure of the 9 times-table using a range of models and pictorial representations, and by exploring multiples of 9 in context. They also use commutativity with the facts they already know from other times-tables.

Children find division facts and explore fact families to embed their understanding of division as the inverse of multiplication.

Things to look out for

- When finding multiplication facts, children may always start at 1 × 9 = 9 and recite the times-table rather than using the number facts they know to find the facts they are not as secure with.
- When writing fact families, children may follow the pattern from multiplication and see division as commutative, writing examples such as 54 ÷ 9 = 6 so 9 ÷ 54 = 6

Key questions

- How many equal groups are there?
  How many are there in each group?
  How many are there altogether?
- How can you use the 10 times-table to work out the 9 times-table?
- How can you use the 3 times-table to work out the 9 times-table?
- What does each number in the calculation represent?
- What patterns can you see in the 9 times-table?

Possible sentence stems

- 9 lots of ______ is equal to ______
- ______ groups of ______ is equal to ______ groups of ______
- ______ × 10 = ______ , so ______ × 9 = ______ – ______ = ______

National Curriculum links

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

Multiply and divide by 9

Key learning

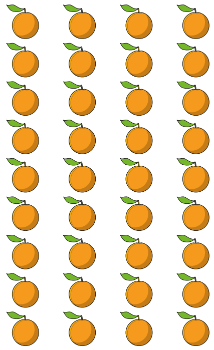
- Complete the sentences to describe the oranges.
  - ▶ There are _______ rows of 4 oranges.

    There are _______ oranges in total.

    _______ × _______ = _______
  - ▶ The oranges are shared into 9 boxes.

    There are _______ oranges in each box.

    _______ ÷ _______ = _______



- Complete the number track.

9	18	27							

What do you notice?

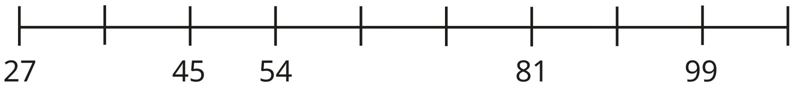
- Here are Annie's workings for 9 × 7

$$\begin{aligned} 9 \times 7 &= 10 \times 7 - 7 \\ &= 70 - 7 \\ &= 63 \end{aligned}$$

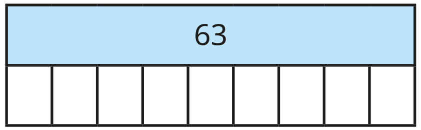
Use Annie's method to complete the number sentences.

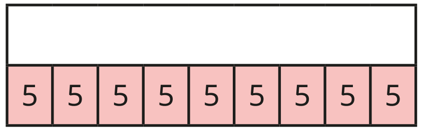
- ▶ 9 × 3 = 10 × ____ − ____
- ▶ 9 × 8 = 10 × ____ − ____
- ▶ 9 × 6 = 10 × ____ − ____
- ▶ 9 × 9 = 10 × ____ − ____

- Complete the number line to show counting in multiples of 9



- Complete the bar models.





Write the fact families for each bar model.

- Mrs Trent has 36 boxes of pencils.

  She shares them equally between 9 classes.

  How many boxes of pencils does each class get?

- Tommy packs 72 eggs into boxes.

  Each box contains 9 eggs.

  How many boxes does he need?

Multiply and divide by 9

Reasoning and problem solving

Here are some multiples of 9

36	45	279	459	981	108

Find the digit sum of each number.

What do you notice?

9, 9, 18, 18, 18, 9

Use what you have learnt about adding the digits together to find out which of these numbers are multiples of 9

477	418	393
999	396	576

477, 999, 396, 576

Amir has 9 bags of 6 sweets.

Whitney has 6 bags of 9 sweets.

Who is correct?

Explain your reasoning.

Neither is correct.

9 times-table and division facts

Notes and guidance

Building on the previous step, children become more fluent using the 9 times-table and apply the multiplication and division facts in a wide variety of contexts.

To establish the facts, children use strategies such as using the 10 times-table to derive the 9 times-table, and understanding that each multiple of 9 is triple the equivalent multiple of 3

They investigate finding the digit sum and look for patterns that will support them in identifying multiples of 9: if the sum of the digits of a number is a multiple of 9, then the number itself is also a multiple of 9. This, and the corresponding rule for the 3 times-table, will support their learning in the next step, where they compare the 3, 6 and 9 times-tables.

Things to look out for

- Children may confuse different terminology to describe multiplication and division, such as "equal groups", "lots of", "times", "multiple" and so on.
- An early mistake when counting in 9s will affect all subsequent multiples.
- Children may use tricks to find multiplication facts in the 9 times-table but not be able to use these to find the related division facts.

Key questions

- How could you use the 10 times-table to work out the 9 times-table?
- If you know a multiplication sentence, what division sentences can you find?
- How can you tell if a number is a multiple of 9?
- How can you use the 3 times-table to work out facts in the 9 times-table?

Possible sentence stems

- ______ × 9 = ______ × 9 + ______ × 9
- ______ × 9 = ______ – ______ = ______
- ______ × 9 = ______, so ______ ÷ 9 = ______
- Multiplying by 9 is the same as multiplying by ______ and then multiplying by ______ again.

National Curriculum links

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

9 times-table and division facts

Key learning

- Complete the sequence counting in 9s.

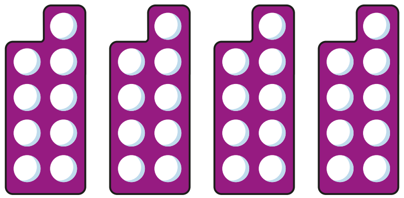
  18, 27, ______, 45, 54, ______, 72, 81, ______, ______, 108

- Which of the numbers are multiples of 9?

  54 108 18 24 9

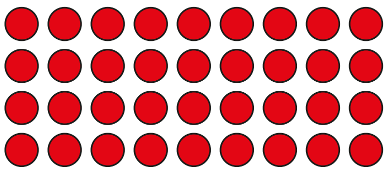
  67 72 37 45

- Write the multiplication fact to work out the total value of the number pieces.

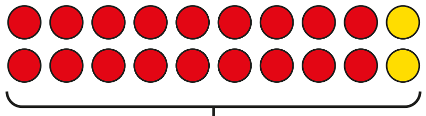


  Write a division fact that you can see from the number pieces.

- Write the fact family to match the array.



- Use the array to complete the number sentences.



  2 × 10 = ______

  2 × 1 = ______

  2 × 9 = ______

  Use this method to complete the number sentences.

  ▸ 3 × 10 = ______ and 3 × 1 = ______ so 3 × 9 = ______

  ▸ 4 × 10 = ______ and 4 × 1 = ______ so 4 × 9 = ______

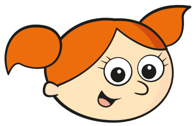
  ▸ 7 × 10 = ______ and 7 × 1 = ______ so 7 × 9 = ______

- Match the inverse operations.

7 × 9 = 63	108 ÷ 9 = 12
3 × 9 = 27	81 ÷ 9 = 9
9 × 9 = 81	27 ÷ 9 = 3
12 × 9 = 108	63 ÷ 9 = 7

9 times-table and division facts

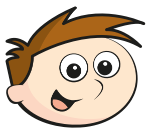
Reasoning and problem solving

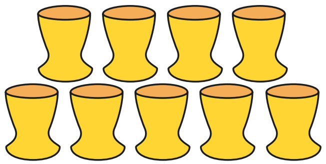


Alex has 63 flowers and some vases.

She puts 9 flowers into each vase.

How many vases does she need?





Teddy has 63 flowers. He has 9 vases.

He puts an equal number of flowers in each vase.

How many flowers does he put in each vase?

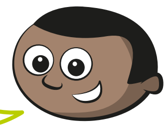
What is the same about these questions? What is different?

7 vases

7 flowers

Mo is thinking of two numbers.

> The sum of my numbers is 17
> The product of my numbers is 72



What are Mo's numbers?

8 and 9

Is this statement always true, sometimes true or never true?

Multiples of 9 are also multiples of 6

Explain your answer.

sometimes true

The 3, 6 and 9 times-tables

Notes and guidance

In this small step, children make links between the 3, 6 and 9 times-tables to deepen their understanding and embed fluency with these times-tables.

This is done by exploring the structure of the times-tables using resources such as arrays and hundred squares, as well as via tasks that require children to reason and explore number facts to look for structural patterns.

On completion of this step, children should be confident with their 2, 3, 4, 5, 6, 8, 9 and 10 times-tables before moving on to look at the remaining times-tables later in the block.

Things to look out for

- Children may see the pattern of doubling 3 times-table facts to find 6 times-table facts, then make the mistake of assuming that they can double the 6 times-table facts to find 9 times-table facts.
- Children may rely on reciting the times-tables, rather than using known facts at other points in the times-tables to help them.
- Even when children are secure in multiplication facts, they may not be confident with the corresponding divisions.

Key questions

- What links can you see between the 3 and 6 times-tables?
- What links can you see between the 3 and 9 times-tables?
- What other times-tables can you use to help find the multiplication facts?
- If you know one multiplication fact, what other multiplication fact do you know? What division facts do you know?
- How do you know if a number is a multiple of 3/6/9?

Possible sentence stems

- Double ______ × 3 = ______ × 6
- Triple ______ × 3 = ______ × 9
- 3 lots of ______ and 6 lots of ______ = 9 lots of ______
- ______ × 3 × 3 = ______ × ______

National Curriculum links

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

The 3, 6 and 9 times-tables

Key learning

- Here is a hundred square.
  - Circle the multiples of 3 in one colour.
  - Circle the multiples of 6 in another colour.
  - Circle the multiples of 9 in a third colour.

  What do you notice?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Here are three number tracks for the 3, 6 and 9 times-tables.

  Complete the number tracks.

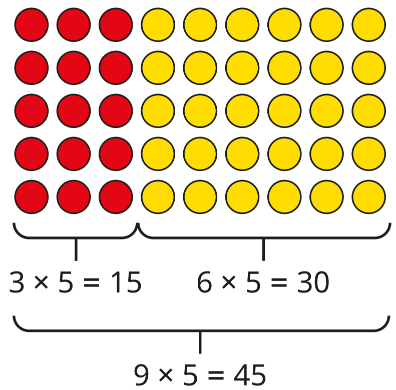
3	6	9	12							33	

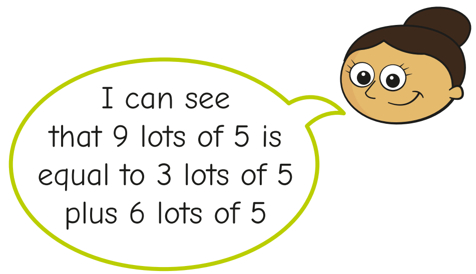
6	12	18							60		

9				45							

  What do you notice?

- Dora has made an array to show 9 × 5





  Draw and label an array to show that 9 × 4 = 3 × 4 + 6 × 4

- What does the bar model show about the connection between the 3 times-table and the 9 times-table?

3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
9			9			9			9			9			9		

- Tommy has 9 bags of 6 apples.

  Write a multiplication to find the total number of apples.

  Write the fact family for this multiplication.

The 3, 6 and 9 times-tables

Reasoning and problem solving

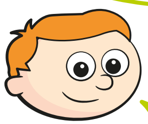
Is the statement true or false?

> All multiples of 3 are also multiples of 6 and 9

Explain your answer.

False

Ron is thinking of a 2-digit number.



My number is a multiple of 3, 6 and 9

There are more tens than ones.

If you halve this number, you get an even number.

What is Ron's number?

72

Scott buys 5 pairs of socks, 4 pairs of shorts and 6 T-shirts.

How much does Scott spend?

£93

Tom and Aisha have £36 between them.

Tom has twice as much money as Aisha.

Tom shares his money between 6 friends.

How much does each friend get?

£4

Multiply and divide by 7

Notes and guidance

In this small step, children use their knowledge of multiples and count in 7s to make the link between repeated addition and multiplication.

Children apply their knowledge of equal groups and use a range of concrete and pictorial representations to deepen their understanding of multiplying by 7. They also draw on ideas from previous steps to explore flexible partitioning to show, for example, 8 × 7 = 5 × 7 + 3 × 7 or 8 × 7 = 8 × 5 + 8 × 2

Children also explore dividing by 7 through sharing into 7 equal groups and grouping into 7s.

Things to look out for

- Children may need support to use the multiplication facts that they are confident in to find the ones they do not know as well.
- Children may not be able to identify which number in a number sentence corresponds with which number in a context.
- Children may find all multiplication facts by starting from 1 × 7 and then reciting their times-table facts, rather than using facts they know to find the facts they do not know.

Key questions

- How many equal groups are there?
- How many lots of 7 do you have?
- How many groups of 7 are there in ______?
- What can you partition ______ into to help you multiply ______ by 7?
- If you know this, what else do you know?
- How can you use the 5/6/8 times-table to find a fact in the 7 times-table?

Possible sentence stems

- ______ × 7 = ______ × 7 + ______ × 7
- ______ × 7 = ______ × 8 – ______ = ______
- There are 7 groups of ______ in ______

National Curriculum links

- Count in multiples of 6, 7, 9, 25 and 1,000
- Recall multiplication and division facts for multiplication tables up to 12 × 12

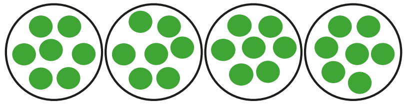
Multiply and divide by 7

Key learning

- Count in 7s to continue the sequence.

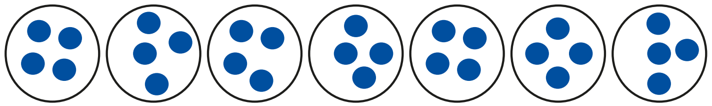
  0 , 7 , ______ , ______ , ______ , ______

- Rosie draws a picture to represent 7 × 4 in two different ways.

  4 sevens

  4 lots of 7

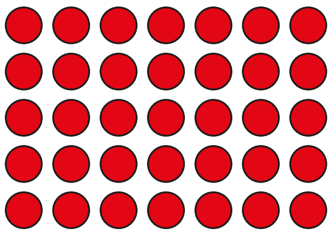
  

  7 fours

  7 lots of 4

  Use Rosie's method to represent 7 × 6 in two ways.

- Write two multiplications and two divisions shown by the array.

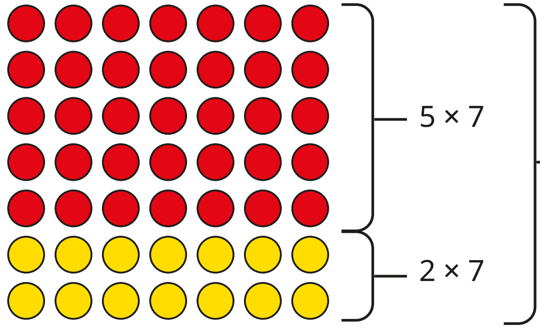
  ______ × ______ = ______

  ______ × ______ = ______

  ______ ÷ ______ = ______

  ______ ÷ ______ = ______

- Amir is using partitioning to help him work out 7 × 7

  Use Amir's method to work out the multiplications.

  6 × 7   9 × 7   11 × 7

- 7 children can sit around one table.

  How many children can sit around 5 tables?

- 7 children can sit around one table.

  There are 63 children.

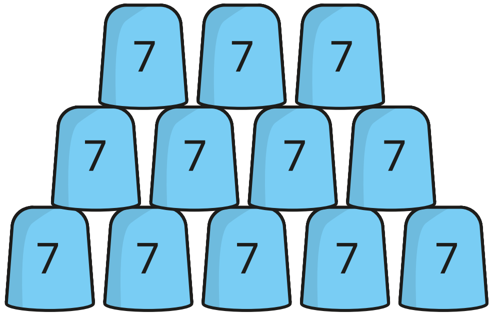
  How many tables are needed?

Multiply and divide by 7

Reasoning and problem solving

Three children are playing a game.

They score 7 points for every cup they knock down.



Here are their scores.

Esther	56
Brett	77
Alex	28

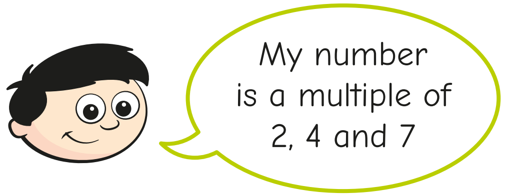
How many cups did each child knock down?

Esther: 8 cups

Brett: 11 cups

Alex: 4 cups

Dexter is thinking of a number less than 70



What number could Dexter be thinking of?

28 or 56

Show that

$$9 \times 7 = 9 \times 8 - 9$$

Draw an array to help you explain your answer.

any correct array

7 times-table and division facts

Notes and guidance

In this small step, children bring together their knowledge of multiplying and dividing by 7 in order to become more fluent in the 7 times-table.

Children construct fact families and use concrete and pictorial representations to make links between multiplication and division. It is important that children understand the structure of the multiplication table and can derive unknown facts from known facts. Children explore links between multiplication tables, investigating how this can help with mental strategies for calculation, such as $9 \times 7 = 9 \times 5 + 9 \times 2$. This step could also be an opportunity to use the 6 and 8 times-tables to derive the 7 times-table, for example $9 \times 7 = 9 \times 8 - 9$ or $9 \times 7 = 9 \times 6 + 9$. Drawing arrays is a useful way of helping children to see these links.

Things to look out for

- Children may need support to use the multiplication facts that they are confident in to find the ones that they do not know as well.
- Children may find all multiplication facts by starting from 1×7 and then reciting their times-table facts, rather than using facts they know to find the facts they do not know.

Key questions

- How many lots of 7 do you have?
- What is the same and what is different about the number facts?
- How does the 7 times-table help you work out the answers?
- What strategies can you use to work out a 7 times-table fact that you do not yet know? What other times-tables can you use?

Possible sentence stems

- ______ × 7 = ______ × 5 + ______ × 2
- ______ × 7 = ______ × 8 – ______
- ______ × 7 = ______ × 6 + ______
- There are 7 groups of ______ in ______
- There are ______ groups of 7 in ______

National Curriculum links

- Count in multiples of 6, 7, 9, 25 and 1,000
- Recall multiplication and division facts for multiplication tables up to 12 × 12

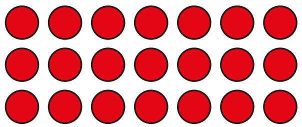
7 times-table and division facts

Key learning

- Complete the number track.

14		28	35		49	56		70		84	91

- Complete the fact family to match the array.



___ × ___ = ___

___ × ___ = ___

___ ÷ ___ = ___

___ ÷ ___ = ___

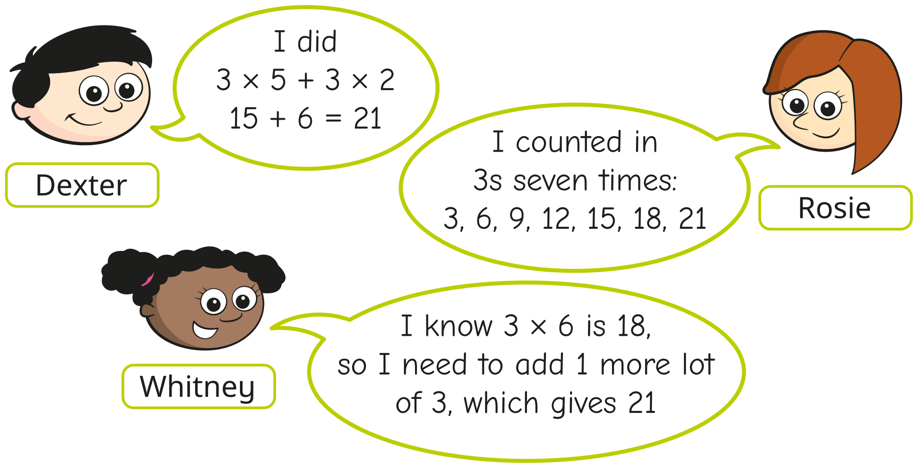
- Match the inverse operations.

8 × 7 = 56	28 ÷ 7 = 4
6 × 7 = 42	84 ÷ 7 = 12
12 × 7 = 84	42 ÷ 7 = 6
4 × 7 = 28	56 ÷ 7 = 8

- Complete the multiplications.

  - 11 × 7 = ___
  - 7 × 9 = ___
  - 70 = ___ × 7
  - ___ × 7 = 21
  - 7 × ___ = 35
  - ___ = 1 × 7

- Dexter, Rosie and Whitney are working out 3 × 7 and explaining their methods.



Whose method do you prefer?

Is one method more efficient than the others?

Choose the method that you prefer to work out the multiplications.

9 × 7	5 × 7	12 × 7

7 times-table and division facts

Reasoning and problem solving

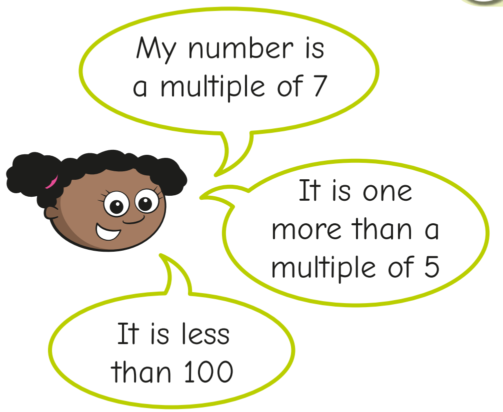
Is the statement true or false?

$6 \times 7 = 5 \times 7 + 5$

Explain your reasoning.

False

Whitney is thinking of a number.



What could Whitney's number be?

21, 56 or 91

7 friends are going to the theme park and having pizza.

Tickets to the theme park cost £30 each.

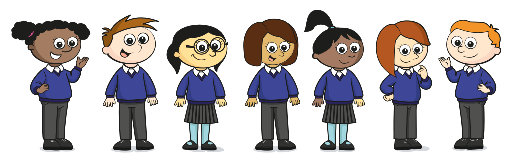
A pizza costs £11

How much does it cost in total for all 7 friends to go to the theme park and to each have one pizza?

£287

Children are arranged into rows of 7

There are 5 girls and 2 boys in each row.



There are 84 children in total.

How many girls are there?

60

11 times-table and division facts

Notes and guidance

In this small step, children build on their knowledge of the 1 and 10 times-tables to explore the 11 times-table. They recognise that they can partition 11 into 10 and 1 and use known facts to support their understanding, for example 7 × 11 = 7 × 10 + 7 × 1 = 77

They use a range of concrete and pictorial representations to deepen their understanding of multiplying by 11 and to make links between multiplying and dividing by 11. They explore dividing by 11 through sharing into 11 equal groups and grouping into 11s.

At this stage, children should already know the majority of facts from other times-tables, so highlighting the importance of commutativity is key in this step.

Things to look out for

- Children may need support to use the multiplication facts that they are confident in to find the ones that they do not know as well.
- Children may not realise that 110, 121, 132 and so on are multiples of 11, as the previous multiples of 11 all have repeated digits, for example 66, 77, 88

Key questions

- How many equal groups are there?
- How many lots of 11 do you have?
- How many groups of 11 are there in ______?
- What can you partition 11 into to help you?
- How can you use base 10 to work out ______ × 11?
- How can you use place value counters to work out ______ ÷ 11?
- How can you show this using an array?

Possible sentence stems

- ______ × 11 = ______
- ______ × 11 = ______ × 10 + ______ × 1
- There are 11 groups of ______ in ______
- There are ______ groups of 11 in ______

National Curriculum links

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

11 times-table and division facts

Key learning

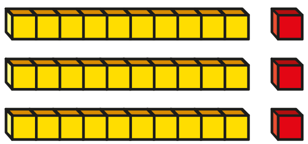
- Complete the sentences.

2 × 10 = ______ 2 × 1 = ______

2 lots of 10 doughnuts = ______ 2 lots of 1 doughnut = ______

2 × 10 + 2 × 1 = 2 × 11 = ______ There are ______ doughnuts.

- Tommy is using base 10 to help him work out 3 × 11



3 × 11 = 33

Use Tommy's method to work out the multiplications.

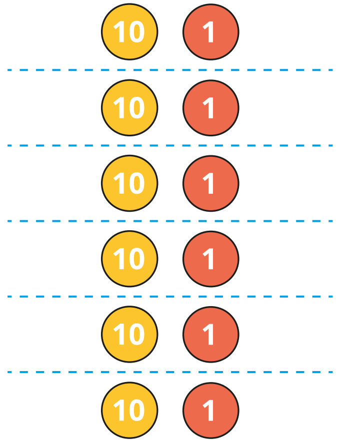
5 × 11	8 × 11	7 × 11
10 × 11	6 × 11	12 × 11

What do you notice?

- There are 11 players in a football team.

  How many players are there in 4 teams?

- Nijah is using place value counters to help her work out 66 ÷ 11



Use Nijah's method to work out the divisions.

99 ÷ 11	55 ÷ 11	22 ÷ 11

- 11 children can sit around one table.

  There are 121 children.

  How many tables are needed?

11 times-table and division facts

Reasoning and problem solving

Here is one batch of muffins.

Amir bakes 11 batches of muffins.

How many muffins does he bake altogether?

In each batch, there are 3 strawberry, 3 vanilla, 4 chocolate and 2 toffee muffins.

How many of each type of muffin does Amir have in 11 batches?

132

strawberry: 33

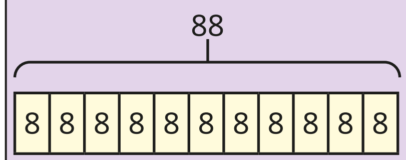
vanilla: 33

chocolate: 44

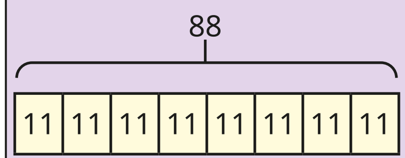
toffee: 22

Match the word problems to the bar models.

Dora has 88 footballs.
She shares them equally into 11 bags.
How many footballs are in each bag?



Dora has 88 footballs.
She wants to put them into bags with 11 footballs in each bag.
How many bags does she use?



Explain your reasoning.

The first problem goes with the first bar model, and the second problem with the second bar model.

12 times-table and division facts

Notes and guidance

In this small step, children build on their knowledge of the 2 and 10 times-tables to explore the 12 times-table. They recognise that they can partition 12 into 10 and 2 and use known facts to support their understanding, for example 7 × 12 = 7 × 10 + 7 × 2 = 84. They also build on their knowledge of the 6 times-table, recognising that multiplying by 12 is the same as multiplying by 6 and then doubling.

Children use a range of concrete and pictorial representations to deepen their understanding of multiplying by 12 and to make links between multiplying and dividing by 12. They explore dividing by 12 through sharing into 12 equal groups and grouping into 12s.

At this stage, children should already know multiplication facts from other times-tables, so highlighting the importance of commutativity is key in this step.

Things to look out for

- Children may need support to use known multiplication facts to find new ones.
- Children may find all multiplication facts by starting from 1 × 12 and then reciting their times-table facts, rather than using facts that they know.

Key questions

- How many equal groups are there?
- How many lots of 12 do you have?
- How many groups of 12 are there in ______?
- What can you partition 12 into to help you?
- How can you use base 10 to work out ______ × 12?
- How can you use place value counters to work out ______ ÷ 12?

Possible sentence stems

- ______ × 12 = ______ × 10 + ______ × 2
- ______ × 12 = double ______ × 6
- There are 12 groups of ______ in ______
- There are ______ groups of 12 in ______

National Curriculum links

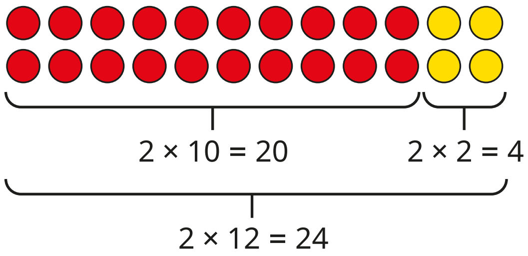
- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Recognise and use factor pairs and commutativity in mental calculations

12 times-table and division facts

Key learning

- Jack has made an array to help him work out 2 × 12

  He has partitioned 12 into 10 and 2



  Use Jack's method to work out the multiplications.

5 × 12	8 × 12	7 × 12
10 × 12	6 × 12	12 × 12

- There are 12 people on a lacrosse team.

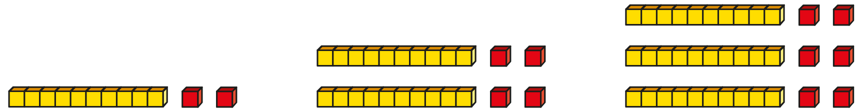
  There are 6 teams in a tournament.

  How many players are there altogether?

- A box holds 12 eggs.

  How many boxes are needed for 36 eggs?

- Sam is building the 12 times-table.



1 × 12 = 12   2 × 12 = 24   3 × 12 = 36

  Use base 10 to help you complete the multiplications.

  - 12 × 5 = ___
  - 5 × 12 = ___
  - 48 ÷ 12 = ___
  - 84 ÷ 12 = ___
  - 12 × ___ = 120
  - 12 × ___ = 132
  - ___ ÷ 12 = 8
  - ___ = 9 × 12

- Write <, > or = to make each statement correct.

  4 × 12 ◯ 6 × 12   7 × 10 + 7 × 2 ◯ 7 × 12

  8 × 12 ◯ 12 × 8   132 ÷ 12 ◯ 12 × 11

  48 ÷ 12 ◯ 72 ÷ 12   9 × 12 ◯ 9 × 6 × 2

12 times-table and division facts

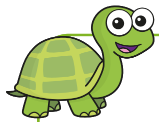
Reasoning and problem solving

Is this statement always true, sometimes true or never true?

When you multiply any whole number by 12, the answer will always be even.

Explain your answer.

always true



Tiny is thinking of a number less than 100

- It is a multiple of 7
- It is one less than a multiple of 12

What is Tiny's number?

35

Complete the table.

×	3	6	12
3			
6			
12			

What connections do you notice between the 3, 6 and 12 times-tables?

9, 18, 36
18, 36, 72
36, 72, 144

Here are the prices of tickets to see a play.

Adult	Child
£12	£6

What possible combination of adults and children could attend if they spend £60?

How many possibilities are there?

Adult	Children
5	0
4	2
3	4
2	6
1	8
0	10

6

Multiply by 1 and 0

Notes and guidance

In this small step, children explore the effect of multiplying by 1. They notice that when they multiply a number by 1, the result will always be the number itself.

This small step also focuses on multiplying by zero. Children learn that when multiplying any number by zero the result is always zero.

A common misconception with this small step is that children confuse the result of multiplying by zero with multiplying by 1. Ensure pictorial representations are used to address this misconception, so that children can see that 4 × 0 is the same as 4 lots of zero, which is equal to zero.

Things to look out for

- Children may use addition instead of multiplication, for example 1 × 1 = 2 and 8 × 1 = 9
- Children may confuse the result of multiplying by zero with multiplying by 1
- When working out a longer multiplication, for example 3 × 4 × 5 × 0, children may start working from left to right rather than realising that as they are mutiplying by zero the answer must be zero.

Key questions

- What does "zero" mean? How can you multiply by zero?
- What do you notice about the results of multiplying numbers by zero?
- What does "multiplying by 1" mean?
- What do you notice about the results of multiplying numbers by 1?
- What is the same and what is different about multiplying by 1 and multiplying by zero?

Possible sentence stems

- Any number multiplied by zero is equal to ______
- Any number multiplied by 1 is equal to ______
- ______ groups of one = ______
- ______ groups of zero = ______

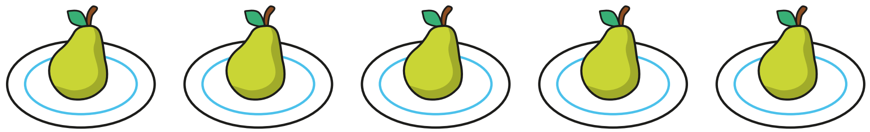
National Curriculum links

- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers

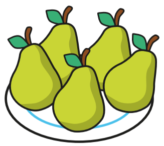
Multiply by 1 and 0

Key learning

- Write a multiplication to work out the total number of pears.

  ▸ 

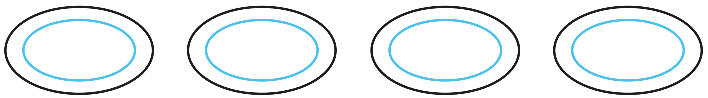
  ______ × ______ = ______

  ▸ 

  ______ × ______ = ______

- There are 4 plates.

  Each plate has zero apples on it.

  How many apples are there in total?

  Complete the multiplication.

  4 × ______ = ______

- Complete the multiplications.

  ▸ 7 × 1 = ___ ▸ 7 × 0 = ___ ▸ 1 × ___ = 12 ▸ 12 × ___ = 0

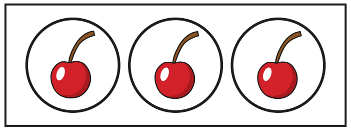
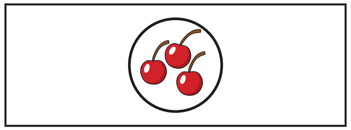
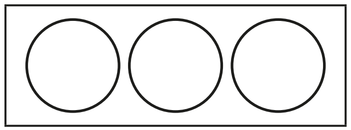
  ▸ 1 × 7 = ___ ▸ 0 × 7 = ___ ▸ ___ × 1 = 12 ▸ 0 = ___ × 12

- Which calculations have an answer of zero?

  48 × 1 0 × 38 1 × 1 0 × 0 4 × 0 10 × 1

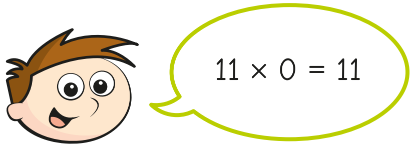
  What do you notice?

- Match the statements to the pictures.

3 lots of 0	
3 lots of 1	
1 lot of 3	

Multiply by 1 and 0

Reasoning and problem solving



Do you agree with Teddy?

Explain your answer.

No

$3 + 0 =$ _____

$3 - 0 =$ _____

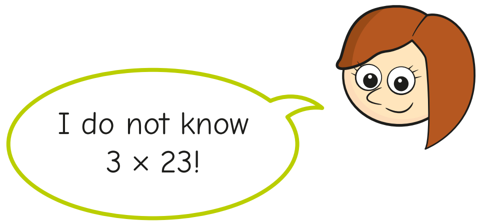
$3 \times 0 =$ _____

Which is the odd one out?

Explain your choice.

3×0
It is the only one with zero as the answer.

Rosie is working out $3 \times 23 \times 0 \times 9$

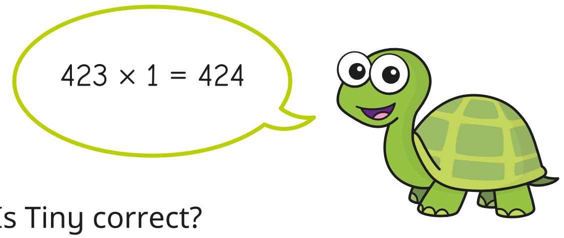


Explain why Rosie does not need to multiply the numbers one by one.

There is a zero in the calculation.

Any number multiplied by zero is zero.

Tiny is multiplying numbers.



Is Tiny correct?

Explain your answer.

No

Divide a number by 1 and itself

Notes and guidance

In this small step, children apply their knowledge of division and explore what happens to a number when they divide it by 1 or itself.

Children can sometimes confuse the result of dividing a number by 1 with dividing a number by itself. Ensure concrete and pictorial representations are used to address this misconception, including examples that involve both structures of division. Stem sentences can be used to encourage children to see this, for example: 5 grouped into 5s is equal to 1 (5 ÷ 5 = 1) and 5 grouped into 1s is equal to 5 (5 ÷ 1 = 5).

Following on from the previous small step, children may try to divide a number by zero and it should be highlighted that this is not possible.

Things to look out for

- Children may assume that division is commutative and think that 12 ÷ 1 = 1 ÷ 12
- Children may confuse the result of dividing a number by 1 with dividing the number by itself.
- Children may think a number divided by itself is zero.

Key questions

- How many equal groups of ______ can you make?
- What is ______ shared equally into 1 group?
- What is ______ grouped into groups of 1?
- What is the same and what is different about multiplying by 1 and dividing by 1?
- What is the same and what is different about dividing a number by 1 and dividing a number by itself?

Possible sentence stems

- When you divide a number by itself, the answer is …
- When you divide a number by ______, the number remains the same.
- There are ______ 1s in ______
- There is 1 ______ in ______

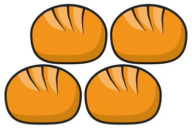
National Curriculum links

- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers

Divide a number by 1 and itself

Key learning

- Complete the sentences.



  4 shared into 1 equal group is equal to ______

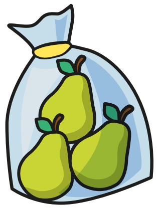
  4 grouped into groups of 1 is equal to ______

  4 ÷ 1 = ______

- Here is a bag of 3 pears.

  The pears are shared between 3 children.

  How many pears does each child get?



  3 ÷ 3 = ______

- Write a division sentence for each statement.

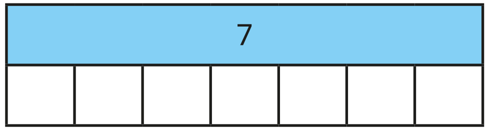
  Use counters to help you.

  - 4 counters shared into 4 groups
  - 9 counters grouped into ones
  - 7 counters shared into 1 group
  - 6 counters grouped into sixes

- Dani bakes 7 cookies.

  She shares them equally between her 7 friends.

  How many cookies does each friend get?



  7 ÷ ______ = ______

- A bag can hold 5 apples.

  Ron has 5 apples.

  How many bags can he fill?

- 8 ÷ 8 = 1   12 ÷ 12 = 1

  What do you notice?

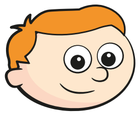
  What other divisions can you write with an answer of 1?

- Which of the divisions have an answer of 1?

  100 ÷ 100   2 ÷ 1   10 ÷ 5   2 ÷ 2

Divide a number by 1 and itself

Reasoning and problem solving



8 × 1 is greater than 8 ÷ 1 because I am multiplying.

Do you agree with Ron?

Explain your reasoning.

No

Without working out the divisions, write <, > or = to compare the statements.

8 ÷ 1 ◯ 7 ÷ 1

6 ÷ 6 ◯ 5 ÷ 5

4 ÷ 4 ◯ 4 ÷ 1

Explain your reasoning.

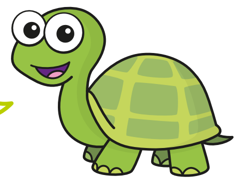
>

=

<

12 ÷ 1 ÷ 3

I only need to divide 12 by 3 to work out the answer.

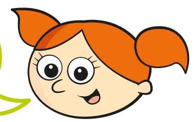


Do you agree with Tiny?

Explain your answer.

Yes

25 divided by 1 is the same as 1 divided by 25



Do you agree with Alex?

Explain your answer.

No

Multiply three numbers

Notes and guidance

In this small step, children apply their knowledge of multiplication to multiply three numbers together.

They are introduced to the idea of the associative law (but do not need to know it by name), which focuses on the fact that it does not matter how they group the numbers when they multiply. For example, 4 × 5 × 2 = (4 × 5) × 2 = 20 × 2 = 40 or 4 × (5 × 2) = 4 × 10 = 40

Encourage children to link this idea to commutativity and change the order of the numbers to group them more efficiently.

Counters and cubes are effective concrete resources to use during this step to support children's understanding of the associative law.

Things to look out for

- Children may need support ordering the numbers to group them more efficiently.
- If children are not confident with their times-table facts, they may struggle with multiplying three numbers.
- Children may automatically work from left to right without looking at the most efficient way to complete a calculation.

Key questions

- Do you have to multiply the numbers from left to right?
- Which pair(s) of numbers do you know the product of?
- How will you decide which order to do the multiplication in?
- What is the same about these calculations/arrays?
- Which order do you find easier to calculate efficiently?
- If you worked out the calculation in a different order, would you get a different answer? Why/why not?

Possible sentence stems

- I am going to work out ______ × ______ first, because …
- To work out ______ × ______ × ______, I can first calculate ______ × ______ and then multiply the answer by ______
- If ______ × ______ = ______, then ______ × ______ × ______ = ______

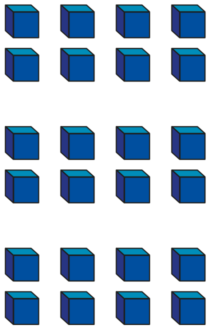
National Curriculum links

- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers

Multiply three numbers

Key learning

- Complete the workings.



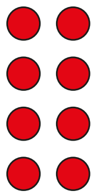
2 × 4 = ______

2 × 4 = ______

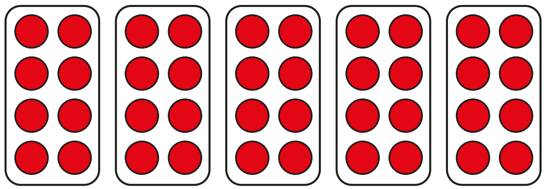
2 × 4 = ______

3 × 2 × 4 = 3 × 8 = ______

- How does the array show 4 × 2?



How does the array show (4 × 2) × 5?



Make an array to show (5 × 2) × 4

What do you notice?

- Find the products.

5 × 2 × 6 8 × 4 × 5 2 × 8 × 6

- Alex and Teddy are working out 6 × 5 × 2

Alex

6 × 5 × 2 = 6 × 5 × 2
= 30 × 2
= 60

Teddy

6 × 5 × 2 = 6 × 5 × 2
= 6 × 10
= 60

Whose method do you prefer?

Is one method more efficient than the other?

Choose the method you prefer to work out the calculations.

7 × 4 × 2 3 × 5 × 4 3 × 4 × 8

- In a field there are 7 animal pens.

In each pen there are 4 rabbit hutches.

In each rabbit hutch there are 3 rabbits.

How many rabbits are there in total?

Multiply three numbers

Reasoning and problem solving

Choose three digit cards.

0	1	2	3	4
5	6	7	8	9

Find the product of your digit cards.

How many different calculations can you make?

What is the most efficient order to use to work out the product?

Answers will vary depending on the numbers chosen.

Kim rolls a 10-sided dice three times.

The product of her numbers is 40

What numbers could she have rolled?

Compare answers with a partner.

multiple possible answers, e.g.
1, 4, 10
1, 5, 8
2, 4, 5
2, 2, 10

Is the statement true or false?

$9 \times 8 = 9 \times 4 \times 2$

Explain your reasoning.

True

Which calculation is the odd one out?

$4 \times 10 \times 2$	$4 \times 4 \times 5$
$5 \times 4 \times 2$	$5 \times 2 \times 8$

Explain your reasoning.

Children can choose any card with the correct justification.