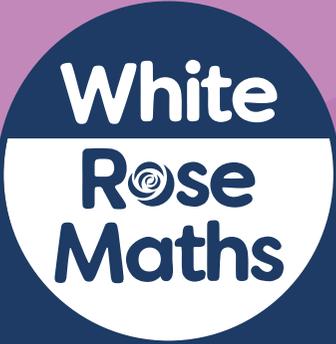


Autumn
Scheme of learning

Year 5

The logo for White Rose Maths, featuring the text "White Rose Maths" in a bold, sans-serif font. The text is white on a dark blue circular background, with the word "Rose" containing a small rose icon.

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.

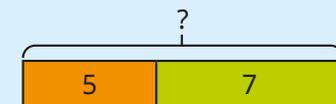
Concrete

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.

An abstract representation of the addition problem 5 + 7. The equation is written inside a yellow rectangular box with a slight shadow.

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.

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

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.

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.

Year 2 | Autumn Term | Block 1 - Place Value | Step 1

Numbers to 20

Key learning

- Complete the number tracks.
 - 0 1 2
 - 10 11 12
 - 7 8 13
- What numbers are shown?
 -
 -
 -

Give your answers in numerals and words.
- What number is shown on each Rekenrek?
 -
 -

Give your answers in numerals and words.
- What numbers are shown?
 -
 -
 -
 -

Give your answers in numerals and words.
- Use words to complete the sentences.
 - The number after four is _____
 - The number before eight is _____
 - The number after nine is _____
- Make each number in three different ways.
 - 19
 - fifteen
 - 16
 - eleven

© White Rose Maths 2022

Activity symbols that indicate an idea can be explored practically

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.

Year 3 | Autumn Term | Block 1 - Place Value | Step 4

Hundreds

Reasoning and problem solving

I am going to count in 100s from zero.

Dora

Write two numbers that Dora will say.

any two multiples of 100

No

Dora will say the number 160

Tiny

Is Tiny correct?
How do you know?

Mo is counting in hundreds.

... 8 hundred, 9 hundred, 10 hundred

Mo should have said 1 thousand, 10 hundreds is equal to 1 thousand.

How should Mo have said the last number?

Balloons come in bags of 10

Rosie has 300 balloons.

Rosie has 30 bags of balloons.

How many bags does she have?

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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



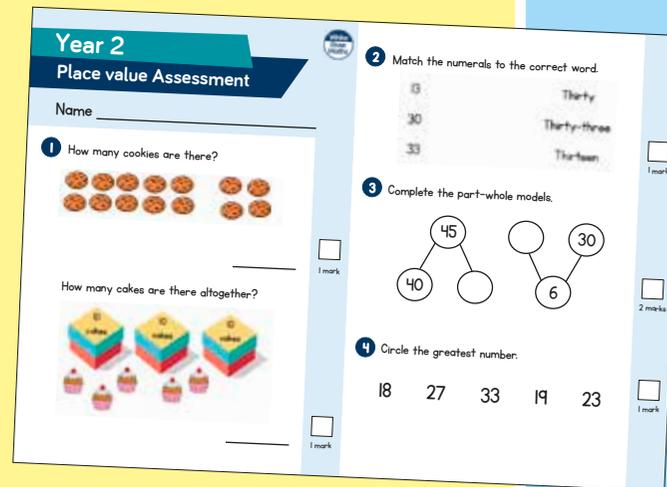
children talk about and compare their answers and reasoning



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.

Free supporting materials

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



Year 2
Place value Assessment

Name _____

1 How many cookies are there?

_____ 1 mark

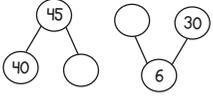
How many cakes are there altogether?

_____ 1 mark

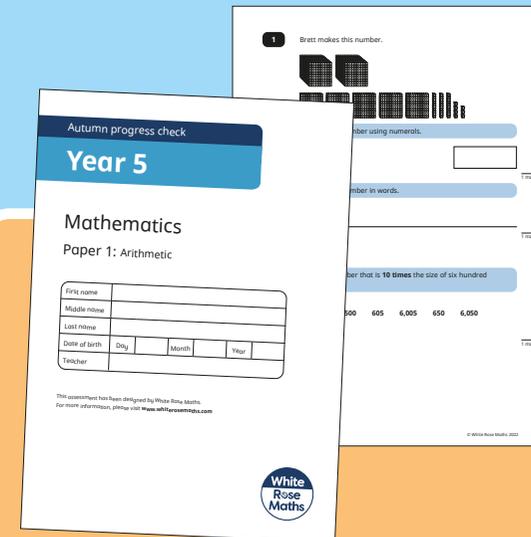
2 Match the numerals to the correct word.

13	Thirty
30	Thirty-three
33	Thirteen

_____ 1 mark

3 Complete the part-whole models.

_____ 2 marks

4 Circle the greatest number.
18 27 33 19 23
_____ 1 mark



Autumn progress check
Year 5
Mathematics
Paper 1: Arithmetic

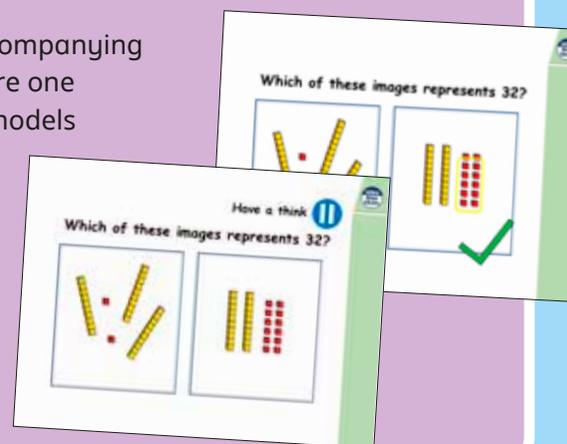
First name			
Middle name			
Last name			
Date of birth	Day	Month	Year
Teacher			

This assessment has been designed by White Rose Maths.
For more information, please visit www.white-rose-maths.com

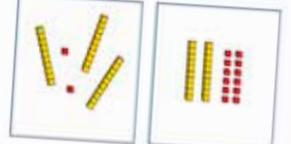
White Rose Maths

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.



Which of these images represents 32?


Have a think
Which of these images represents 32?


Free supporting materials

Primary Progression – Place Value						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Place Value: Counting	<ul style="list-style-type: none"> 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 <p>Autumn 1 Autumn 4 Spring 2 Summer 4</p>	<ul style="list-style-type: none"> count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward <p>Autumn 1</p>	<ul style="list-style-type: none"> count from 0 in multiples of 4, 8, 50 and 100, find 10 or 100 more or less than a given number <p>Autumn 1 Autumn 3</p>	<ul style="list-style-type: none"> count in multiples of 6, 7, 9, 25 and 1000 count backwards through zero to include negative numbers <p>Autumn 1 Autumn 4</p>	<ul style="list-style-type: none"> 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 <p>Autumn 1</p>	

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

Skill: Add three 1-digit numbers

Year: 2

When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently.

This supports children in their understanding of commutativity.

Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

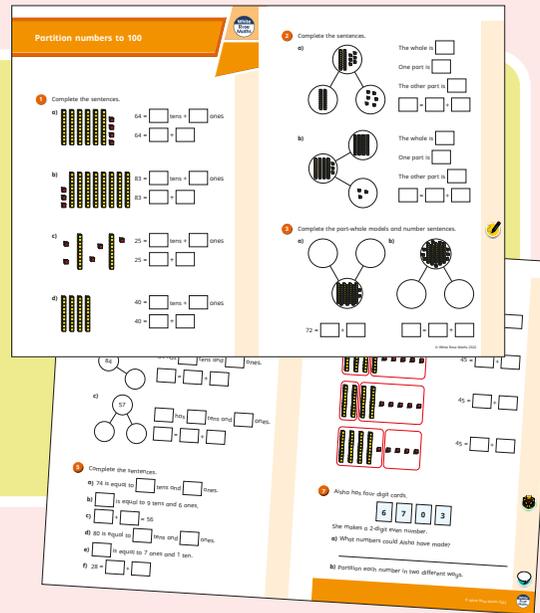
Calculation policies that show how key approaches develop from Year 1 to Year 6.

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 know additive and multiplicative number facts (scaling facts by 10).
White Rose Maths Small Steps	Autumn 2 Addition and Subtraction <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Related calculations Scaling Spring 4 Measurement: Length and Perimeter <ul style="list-style-type: none"> Equivalent lengths (m and cm) Equivalent lengths (mm and cm)

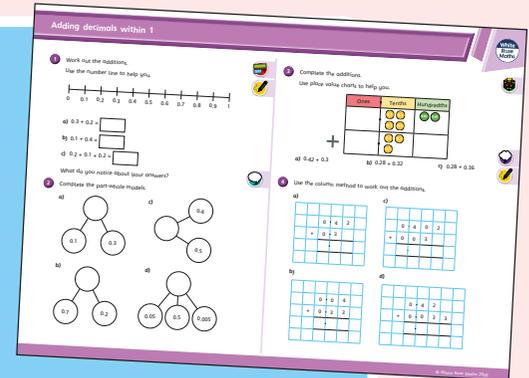
Ready to progress mapping that shows how the schemes of learning link to curriculum prioritisation.

Premium supporting materials

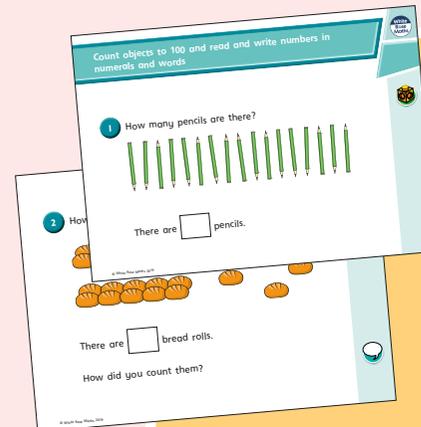
Worksheets to accompany every small step, providing relevant practice questions for each topic that will reinforce learning at every stage.



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

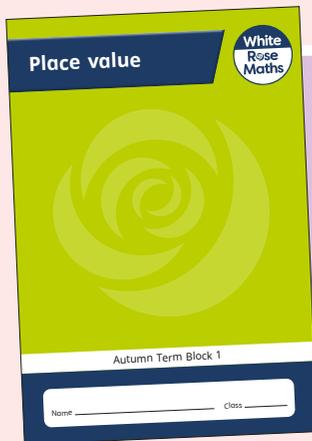


PowerPoint™ versions of the worksheet questions to incorporate them into lesson planning.



Answers to all the worksheet questions.

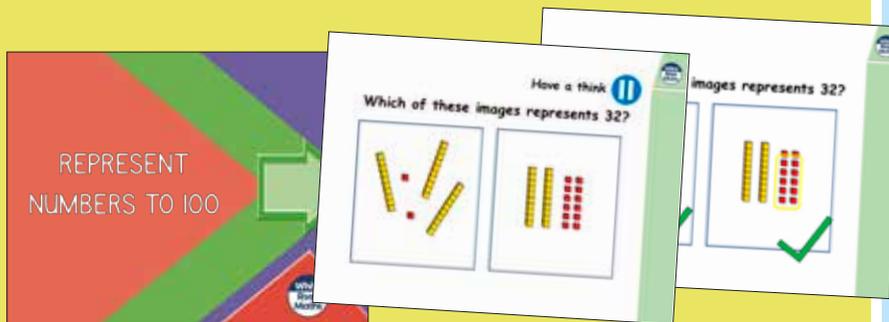
Question	Answer
1	There are 17 pencils.
2	There are 17 bread rolls. Children may have counted 3 tens and 3 rolls.
3	twenty-eight
4	sixty-two
5	4 tens and 5 ones
6	a) seventeen b) twenty-one c) thirty-five d) eighty-two
7	a) 12 b) 80 c) 100 d) 9 e) 27 f) 14
8	79, 80, 81, 82, 83, 85 70, 79, 66, 64, 63
9	Fox has 20 sweets. Fox's friend gives her 7 sweets.



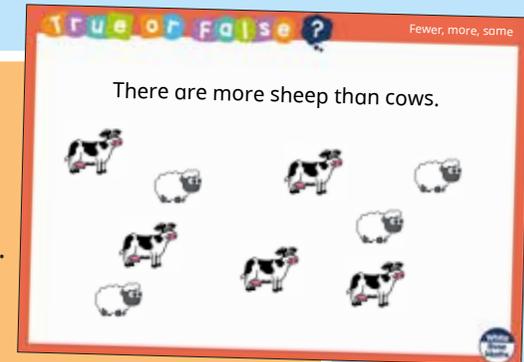
Also available as printed **workbooks**, per block.

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.

Flashback 4 Year 4 | Week 5 | Day 1

- 1) Round 6,495 to the nearest 10, 100 and 1,000 5×2
6,500 6,500 6,000
- 2) Round 38 to the nearest 10 40
- 3) Complete the part-whole model.
 $7,631 = 7,000 + 600 + 31$
- 4) Multiply 38 by 4 152



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		Number Multiplication and division A			Number Fractions A			
Spring	Number Multiplication and division B			Number Fractions B		Number Decimals and percentages			Measurement Perimeter and area		Statistics	
Summer	Geometry Shape			Geometry Position and direction		Number Decimals			Number Negative numbers	Measurement Converting units		Measurement Volume

Autumn Block 1

Place value

Small steps

Step 1

Roman numerals to 1,000

Step 2

Numbers to 10,000

Step 3

Numbers to 100,000

Step 4

Numbers to 1,000,000

Step 5

Read and write numbers to 1,000,000

Step 6

Powers of 10

Step 7

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

Step 8

Partition numbers to 1,000,000

Small steps

Step 9

Number line to 1,000,000

Step 10

Compare and order numbers to 100,000

Step 11

Compare and order numbers to 1,000,000

Step 12

Round to the nearest 10, 100 or 1,000

Step 13

Round within 100,000

Step 14

Round within 1,000,000

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

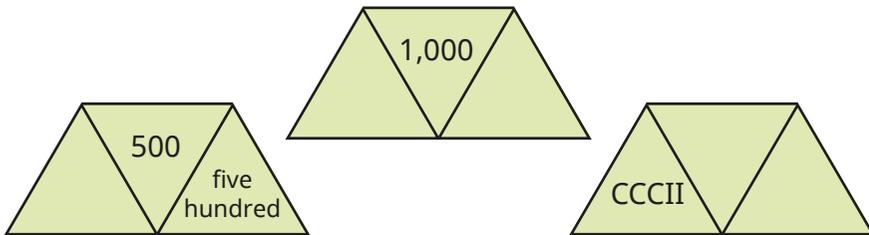
- Read Roman numerals to 1,000 (M) and recognise years written in Roman numerals

Roman numerals to 1,000

Key learning

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

Complete the diagrams.



- Match the Roman numerals to the numbers.

DC

460

CD

950

CCCXX

400

DXC

590

CML

600

CDLX

320

- Here is a date written in Roman numerals.

XXI / IX / MMXV

What day of the month is shown?

What month is shown?

What year is shown?

- Here are the end credits of two films.

The Roman numerals show the year the films were made.



In what year was the older film made?

In what year was the more recent film made?

How long was there between the making of the two films?

Give your answer in Roman numerals.

Roman numerals to 1,000

Reasoning and problem solving

Work out CCCL + CL.

Give your answer in Roman numerals.

Write five calculations, using Roman numerals, that give the same answer.

Compare answers with a partner.

D

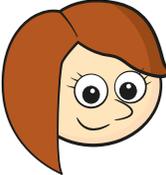
multiple possible answers, e.g.

CD + C

M ÷ II

C + CC + CC

C × V



XL - X = L

Do you agree with Rosie?

Explain your answer.

No

Is the statement true or false?

In Roman numerals,
400 is CD,
so 800 is CDCD.

False

The numbers in the sequence are increasing by CXX each time.

, , , ,

Work out the missing numbers in the sequence.

DL, DCLXX,
CMX, MXXX

Numbers to 10,000

Notes and guidance

Children encountered numbers up to 10,000 in Year 4. In this small step, they revise this learning in preparation for looking at numbers to 100,000 and then 1,000,000

A variety of pictorial and concrete representations are used, including base 10, place value counters, place value charts and part-whole models. In particular, the ability to use place value charts needs to be secure, as this is the main representation used in the coming steps where children learn about 5- and 6-digit numbers.

Children should also be able to add and subtract 10, 100 and 1,000 to and from a given number, using their place value knowledge rather than formal written methods.

Things to look out for

- Children may not yet have fully grasped placeholders, for example reading 208 as twenty-eight.
- Children may rely on the column method of addition and subtraction when this is not necessary.
- Children may not use, or may misplace, the comma when writing numbers greater than or equal to 1,000

Key questions

- What is the value of each digit in the number?
- How can you represent the number in a different way?
- Which digit or digits would change in value if you added a 10/100/1,000 counter?
- How do you write the number in words?

Possible sentence stems

- The value of the _____ in _____ is _____
- The column before/after the _____ column is the _____ column.
- 10 _____ can be exchanged for 1 _____
- 1 _____ can be exchanged for _____

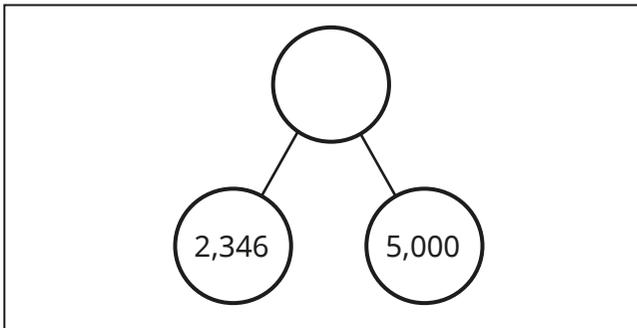
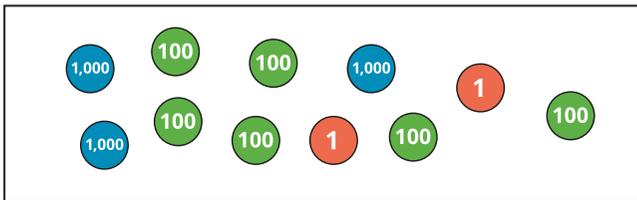
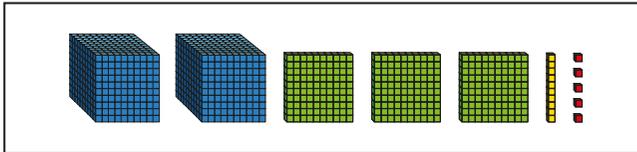
National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
- Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000

Numbers to 10,000

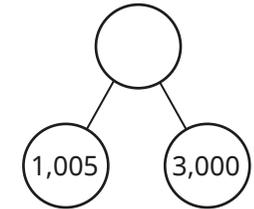
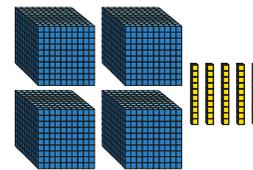
Key learning

- What numbers are shown?



Th	H	T	O
●●		●●●	●●
●		●●●	●●
		●●	

- Match the representations to the numbers.



4,005

4,500

4,050

- Show the number 2,536 in three different ways.
- What number is shown in the place value chart?

Th	H	T	O
●●	●●		●
●	●●		
	●		

What will the number be if you add a counter to the thousands column?

What will the number be if you take two counters away from the hundreds column?

Numbers to 10,000

Reasoning and problem solving

Filip has made five numbers using the digits 1, 2, 3 and 4

He is using a letter to represent each digit.

Here are his numbers.

AABCD
ACDCB
DCABA
CDADC
BDAAB



- 44,231
- 43,132
- 13,424
- 31,413
- 21,442

Use the clues to work out each number.

- The first number in the list is the greatest number.
- The digits in the fourth number add up to 12
- The third number is the smallest number.

Work out the missing numbers.

	Add 10	Add 100	Add 1,000
7,516			
			5,209
		6,025	
	3,001		

	Add 10	Add 100	Add 1,000
7,516	7,526	7,616	8,516
4,209	4,219	4,309	5,209
5,925	5,935	6,025	6,925
2,991	3,001	3,091	3,991

Numbers to 100,000

Notes and guidance

In this small step, children build on the Year 4 learning revised in the previous step, and explore numbers up to 100,000

They are introduced to the ten-thousands column in a place value chart and begin to understand the multiples of 10,000. This can be reinforced using a number line to 100,000

Both place value counters and plain counters are used in place value charts, allowing for discussion about the values of the columns.

Children estimate the position of numbers such as 65,048 on a number line, preparing them for rounding later in this block.

Things to look out for

- Children are likely to use “thousands” and “millions” in everyday speech more often than “tens of thousands” or “hundreds of thousands”, so they may miss out place value columns in between.
- Children may find numbers with several placeholders difficult, for example 40,020
- Children may need support in deciding when to use the word “and” when saying numbers, for example 3,100 does not use “and” but 3,010 does.

Key questions

- Counting in 1,000s, what would you say after “nine thousand”?
- Counting in 10,000s, what would you say after “sixty thousand”?
- How can you represent the number 65,000 using a number line?
- What is the value of each digit in the number?
- If 100,000 is the whole, what could the parts be?

Possible sentence stems

- The value of the _____ in _____ is _____
- The column before/after the _____ column is the _____ column.

National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
- Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000

Numbers to 100,000

Key learning

- What number is shown on the place value chart?

TTh	Th	H	T	O

- Complete the grid to show the number in different ways.

place value counters	part-whole model										
65,048											
<p>bar model</p>	<table border="1" style="width: 100%;"> <thead> <tr> <th>TTh</th> <th>Th</th> <th>H</th> <th>T</th> <th>O</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>place value chart</p>	TTh	Th	H	T	O					
TTh	Th	H	T	O							

- Find the missing numbers.

▶ $59,000 = 50,000 + \underline{\hspace{2cm}}$

▶ $\underline{\hspace{2cm}} = 30,000 + 1,700 + 80$

▶ $75,480 = \underline{\hspace{2cm}} + 3,000 + \underline{\hspace{2cm}}$

Do any of the questions have more than one possible answer?

- A number is shown in the place value chart.

TTh	Th	H	T	O

What number is represented?

A counter is removed from the thousands column.

What number is represented now?

A counter is then added to the tens column.

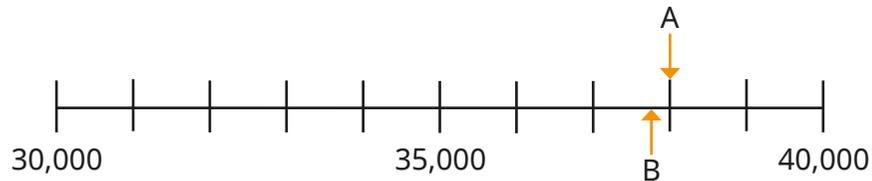
What number is represented now?

- Count down in 10,000s from 157,000 to 27,000

Numbers to 100,000

Reasoning and problem solving

Here is a number line.



What is the value of A?

B is 100 less than A.

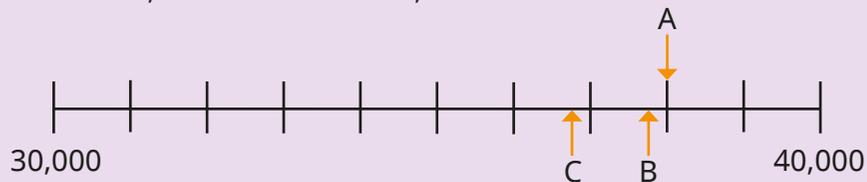
What is the value of B?

C is 1,000 less than B.

Label C on the number line.

A = 38,000

B = 37,900



Write as many different numbers as you can, using each word no more than once.

You do not need to use all the words each time.

and	four	thousand
one	hundred	

1, 4, 100, 104, 400,
401, 1,000, 1,004,
1,400, 4,000, 4,001,
4,100, 100,000,
100,004, 104,000,
400,000, 400,001,
401,000

List all the 5-digit numbers you can make using the digit cards.



1	2	0	0	0
---	---	---	---	---

12,000, 10,200,
10,020, 10,002,
21,000, 20,100,
20,010, 20,001

Numbers to 1,000,000

Notes and guidance

In this small step, children build on the previous steps and explore numbers up to 1,000,000

Children learn that the pattern for thousands in a place value chart follows the same pattern as that of the ones: ones, tens, hundreds, (one) thousands, ten thousands, hundred thousands. Children recognise large numbers presented in a variety of ways using familiar models. Reading numbers is touched on in this step and then developed in the next step, which also looks at writing numbers in words.

Partitioning is introduced but will be covered in more detail later in the block.

Things to look out for

- Children may find it difficult to conceptualise such large numbers as they lie outside their everyday experience and cannot easily be represented concretely.
- Unless they are confident with the previous step, children may think that place value columns go in the order ones, tens, hundreds, thousands, millions.
- Children may find numbers with several placeholders difficult.

Key questions

- Where do the commas go when writing one million in numerals?
- How does a place value chart help you to represent large numbers?
- What is the value of each digit in this number?
- Are 6-digit numbers always greater in value than 5-digit numbers?
- When do you use placeholders in numbers?
- If one million is the whole, what could the parts be?

Possible sentence stems

- The value of the _____ in _____ is _____
- The column before/after the _____ column is the _____ column.

National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
- Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000

Numbers to 1,000,000

Key learning

- What number is shown in each place value chart?

Give your answers in numerals.

HTh	TTh	Th	H	T	O
●● ●●	●●	●●	●● ●●	●● ●●	●

Thousands			Ones		
H	T	O	H	T	O
●● ●●	●●	●●	●● ●●	●● ●●	●

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

- Use counters to make the numbers on a place value chart.

32,651	463,215	320,154	60,020
--------	---------	---------	--------

- Count in 100,000s from zero to 1 million.

- Use counters to make the numbers on the place value chart.

372,524	206,401	300,042	71,560
---------	---------	---------	--------

Thousands			Ones		
H	T	O	H	T	O

How would you say the numbers?

- What is the value of the 4 in each number?

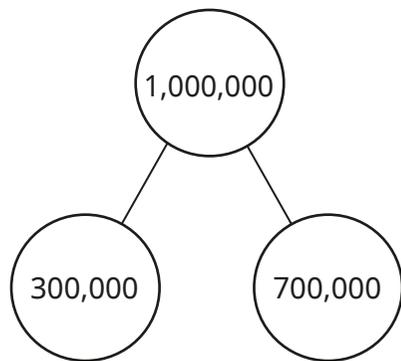
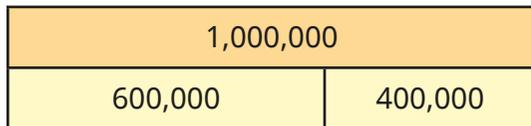
124,306	245,812	402,001
321,247	604,513	45,872

- Write four numbers that have a 3 in the hundreds column. Each number should have a different number of digits.

Numbers to 1,000,000

Reasoning and problem solving

Here are two ways of partitioning one million into multiples of 100,000



How many other ways can you find to partition one million into multiples of 100,000?

Show your answers as bar models and part-whole models.

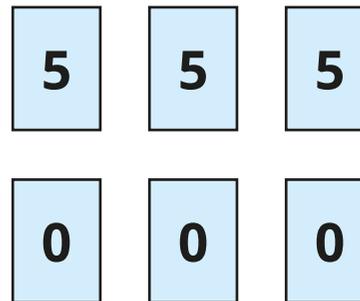


There are four more ways:

- 0 and 1,000,000
- 100,000 and 900,000
- 200,000 and 800,000
- 500,000 and 500,000

The numbers can be written in either order.

Use the digit cards to make as many 6-digit numbers as you can.



What is the greatest number you can make?

What is the smallest number you can make?

What is the difference between the greatest and smallest numbers?

Ten 6-digit numbers can be made:

- 555,000 505,050
- 550,500 505,005
- 550,050 500,550
- 550,005 500,505
- 505,500 500,055

555,000

500,055

54,945

Read and write numbers to 1,000,000

Notes and guidance

Children should be secure with the place value of numbers to 1,000,000. In this small step, they develop their skill at reading and writing large numbers in words, which has been touched on in earlier steps.

While the spelling of the individual words is important, the focus of the step is the structure of the written words, for example we read and write 4,100 as “four thousand one hundred” but 4,010 as “four thousand and ten”.

Using a comma as a separator helps with reading and writing numbers in two parts, and a part-whole model or place value chart can be used to support this.

Things to look out for

- Children who find the “teen” numbers difficult may have problems with numbers such as 317,413
- Children may find reading and writing numbers with placeholders (for example, 700,011) difficult.
- Knowing when to use the word “and” within a number can sometimes cause confusion.

Key questions

- When a number is written with commas, what do the numbers before/after each comma represent?
- How can this number be represented using a part-whole model? What parts would it be sensible to use?
- How do you write “1,000,000” in words?
- When do you use the word “and” when reading or writing a number?

Possible sentence stems

- The number before/after the comma is _____. This part of the number is said/written as _____
- The whole of the number is said/written as _____

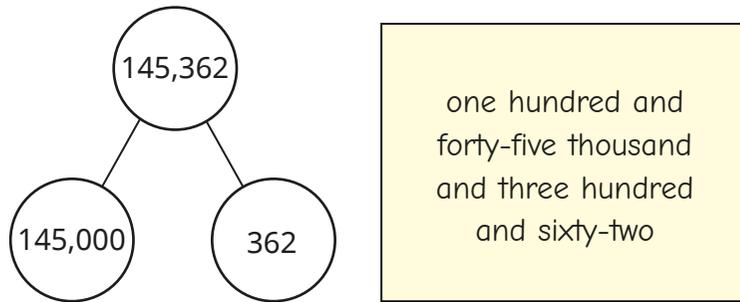
National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
- Solve number problems and practical problems involving the above

Read and write numbers to 1,000,000

Key learning

- Scott is using a part-whole model to help write the number 145,362 in words.



Scott has made one mistake.

Write 145,362 correctly in words.

- 56,402 is shown in the place value chart.

Thousands			Ones		
H	T	O	H	T	O
	●● ●● ●	●● ●● ●●	●● ●●		●●

Write the number 56,402 in words.

How does the place value chart help you?

- Write the numbers in words.

1,256	12,560	125,600	120,560	120,506
-------	--------	---------	---------	---------

You could write the numbers in a place value chart to help you.

- A number is made up of 2 ten-thousands, 5 hundreds and 7 ones.

Show the number on a place value chart.

Write the number in words and numerals.

- Write the numbers in numerals.

three hundred and six thousand and fifteen

three hundred and six thousand and fifty

three hundred and fifteen thousand and six

- Use place value counters to make the number "half a million".

Write the number "half a million" in numerals.

Read and write numbers to 1,000,000

Reasoning and problem solving

I'm thinking of a 6-digit number. The sum of the digits is 2



Find all the possible numbers Tiny could be thinking of.

Give your answers in words and numerals.

Investigate with different digit sums.

What do you notice?



- 200,000
two hundred thousand
- 110,000
one hundred and ten thousand
- 101,000
one hundred and one thousand
- 100,100
one hundred thousand, one hundred
- 100,010
one hundred thousand and ten
- 100,001
one hundred thousand and one

When written in words, what is the first number that includes the letter "a"?

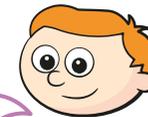


one hundred and one

Ron is thinking of a number.



My number is made up of 7 hundred-thousands, 13 thousands and 19 tens.



What is 1,000 less than Ron's number?

What is 10 more than Ron's number?

Give your answers in words.

seven hundred and twelve thousand, one hundred and ninety
seven hundred and thirteen thousand, two hundred

Powers of 10

Notes and guidance

In this small step, children further develop their understanding of place value by exploring the relationship between numbers in different columns.

As well as adjacent columns, they look at columns that are further apart, for example considering the number of tens needed to make 1,000 and then multiples of 1,000. Children use both place value charts and Gattegno charts to support their understanding. You could demonstrate exchanging with place value counters as extra support if needed.

Multiplication by 10, 100 and 1,000 is covered in detail later in the term. The focus here is on the place value of the digits rather than performing calculations.

Things to look out for

- Children may not realise that the overall effect of, for example, $\times 10$ followed by $\times 10$ is $\times 100$
- Children may find it confusing that numbers increase by a factor of 10 horizontally on a place value chart but vertically on a Gattegno chart.

Key questions

- How can you tell if a number is a power of 10?
- Is this number a multiple of a power of 10? How can you tell?
- If you move a digit one place to the left in a place value chart, how many times greater is the value of the digit?
- If you move a digit two places to the left in a place value chart, how many times greater is the value of the digit?
- What patterns can you see in the Gattegno chart?

Possible sentence stems

- There are _____ hundreds in 1,000 and _____ thousands in _____. This means there are _____ hundreds in _____
- _____ is _____ the size of _____

National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
- Solve number problems and practical problems that involve the above

Powers of 10

Key learning

- Make the number 425 on a place value chart.

Thousands			Ones		
H	T	O	H	T	O

Now make the number 4,250

What is the same and what is different?

- How many tens are there in 100?
How many tens are there in 200?
How many tens are there in 210?
How many tens are there in 740?
- How many tens are there in 100?
How many tens are there in 1,000?
How many tens are there in 2,000?
How many hundreds are there in 2,000?

- What number is shown on the Gattegno chart?

100,000	200,000	300,000	400,000	500,000	600,000	700,000	800,000	900,000
10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000
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

Use the chart to find the number 100 times the size of the number shown.

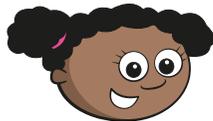
Use the chart to make the number one-tenth the size of the number shown.

- Complete the sentences.
 - ▶ There are 1,000 metres in a kilometre.
_____ km is the same distance as 68,000 m.
 - ▶ There are 1,000 millimetres in a metre.
_____ mm is the same length as 803 m.

Powers of 10

Reasoning and problem solving

Whitney and Amir use a Gattegno chart to answer questions.



My answer is 620,000

Whitney

What could Whitney's question be?

My answer is 602,000



Amir

What could Amir's question be?

multiple possible answers, e.g.
What is 10 times the size of 62,000?

multiple possible answers, e.g.
What is 100 times the size of 6,020?

Large areas are measured in hectares.



1 hectare = 10,000 m²

The area of the Eden Park stadium in New Zealand is 15 hectares.

What is the area of Eden Park in m²?

How many plots with an area of 100 m² could be made in Eden Park?

15,000 m²

150

$$1,000 \times 1,000 = 1,000,000$$

How many other calculations using just ones and zeros can you find that have the answer 1,000,000?

multiple possible answers, e.g.
10,000 × 100
100,000 × 10
1,000,000 × 1
100 × 100 × 100
100 × 10 × 1,000

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

Notes and guidance

In this small step, children use place value to find numbers 10/100/1,000/10,000/100,000 more or less than a given number. They need to be able to count both forwards and backwards in steps of powers of 10, and should be encouraged to spot patterns in the sequences formed by doing this. Children could be stretched to consider the rule that connects consecutive terms in the resulting sequences.

As well as finding consecutive values when counting forwards and backwards, children should also be able to find missing numbers that lie between two other given values.

A Gattegno chart is useful to support adding the correct power of 10, and to see what happens when crossing a 10/100/1,000 ... boundary.

Things to look out for

- Children may make errors when they are counting across a multiple of 10, 100, 1,000 ... For example, 2,080, 2,090, 3,000
- More support may be needed when counting backwards.

Key questions

- How can you use a place value chart to find 10/100/1,000 ... more/less than a given number?
- How can you use a Gattegno chart to find 10/100/1,000 ... more/less than a given number?
- How many digits of the number will change if you add 10/100/1,000 ... to the given number?
- What is the same and what is different about the patterns of the numbers vertically and horizontally in a Gattegno chart?

Possible sentence stems

- _____ more/less than _____ is _____
- _____ is _____ more/less than _____

National Curriculum links

- Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000
- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit

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

Key learning

- Here is a Gattegno chart showing the number 32,450

10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000
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

What number is 10 more than 32,450?

What number is 100 less than 32,450?

What number is 10,000 less than 32,450?

- 20,417 is shown in the place value chart.

TTh	Th	H	T	O
●●		●● ●●	●	●● ●● ●● ●

What is 100 more than 20,417?

What is 10 less than 20,417?

What is 1,000 less than 20,417?

- Complete the number tracks.

663	673		693		713	
-----	-----	--	-----	--	-----	--

7,200		7,000			
-------	--	-------	--	--	--

7,200		6,800			
-------	--	-------	--	--	--

- Count up in 1,000s starting from 6,240
- Count up in 10,000s starting from 6,240
- Count up in 100,000s starting from 6,240

- Correct the mistake in each number sequence.

7,875	,	8,875	,	9,875	,	11,875	,	12,875	,	13,875
-------	---	-------	---	-------	---	--------	---	--------	---	--------

864,664	,	764,664	,	664,664	,	554,664	,	444,664
---------	---	---------	---	---------	---	---------	---	---------

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

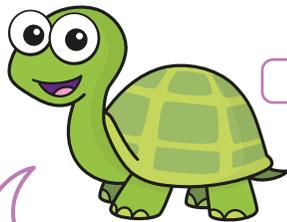
Reasoning and problem solving

Amir is counting in thousands.



3,000, 4,000,
5,000, 6,000, 7,000

Amir



Tiny

The tenth number
Amir will say is
14,000 because it is
double 7,000

Do you agree with Tiny?
Explain your answer.



No



Jack

I am counting up
in tens from 184
I will include 224

I am counting up
in hundreds from 604
I will include 1,040



Whitney



Teddy

I am counting up
in thousands from 13
I will include 13,000

Are the children correct?
Explain how you know.

Jack is correct.

Whitney is incorrect. All her numbers will end in 04

Teddy is incorrect. All his numbers will end in 13

Partition numbers to 1,000,000

Notes and guidance

Children have been partitioning numbers since Year 2. In this small step, they extend their knowledge to deal with larger numbers while consolidating their understanding of the place value columns that have been introduced this year.

They partition numbers in the standard way (for example, into thousands, hundreds, tens and ones) as well as in more flexible ways (for example, $15,875 = 14,875 + 1,000$ and $15,875 = 13,475 + 2,400$).

Understanding of partitioning, for example changing 62 to $50 + 12$, supports methods for addition and subtraction that will be reviewed in the next block.

Things to look out for

- Children may make mistakes with the order of the digits when partitioning/recombining numbers with many digits.
- Children may be less familiar with non-standard partitioning and need the support of, for example, place value counters to see alternatives.
- Children may wish to apply a formal method when the values of the digits in the columns make it more appropriate.

Key questions

- What number is being represented?
- How can place value cards be used to help partition a number?
- If you have 10 hundreds/thousands/ten-thousands, what can these be exchanged for?
- How does knowing that $9 + 5 = 14$ help you to work out 9 tens + 5 tens? What about 9 thousands + 5 thousands?
- How else can you say/write “14 tens” or “14 thousands”?

Possible sentence stems

- The value of the first digit is _____
- The value of the next digit is _____
- _____ is equal to _____ thousands, _____ hundreds, _____ tens and _____ ones.

National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit

Partition numbers to 1,000,000

Key learning

- Partition the numbers into thousands, hundreds, tens and ones.

▶ $6,789 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$

▶ $4,813 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$

- Complete the number sentences.

▶ $\underline{\quad} = 20,000 + 7,000 + 800 + 40 + 3$

▶ $560,830 = \underline{\quad} + 60,000 + \underline{\quad} + 30$

- Move the place value counters around and make exchanges to help you complete the partitions.



$32,426 = 30,000 + 2,000 + \underline{\quad} + 20 + 6$

$32,426 = 20,000 + \underline{\quad} + 400 + 10 + \underline{\quad}$

$32,426 = 10,000 + 22,000 + \underline{\quad} + \underline{\quad}$

Is there more than one answer for any of these?

Find other ways to partition the number.

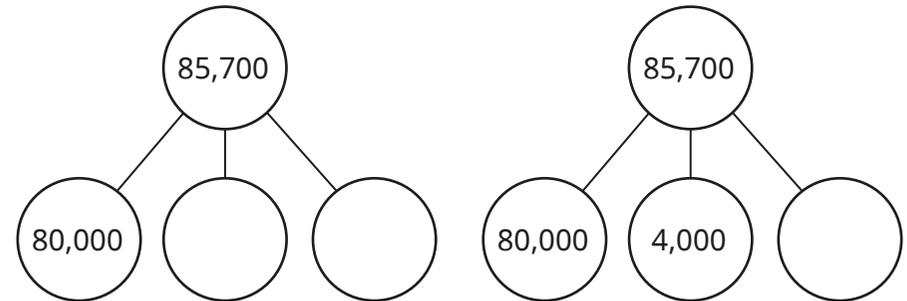
- Aisha is partitioning 45,627

$40 + 50,000 + 600 + 2 + 7,000 = 45,627$

Explain why Aisha's workings are wrong.

Find the correct total.

- Complete the part-whole models for 85,700



Find three more ways of partitioning 85,700 into three parts.

- Complete the calculations.

▶ $367,201 = 200,000 + \underline{\quad}$

▶ $40,000 + 27,600 + 250 = \underline{\quad}$

▶ $945,006 = 610,000 + \underline{\quad} + 6$

Partition numbers to 1,000,000

Reasoning and problem solving

Esther is partitioning a number written in Roman numerals.

$$\text{MMDXL} = \text{M} + \text{M} + \text{D} + \text{X} + \text{X} + \text{X} + \text{X}$$

Is Esther correct?

Find some other ways of partitioning the number using Roman numerals.

Esther is correct.

multiple possible answers, e.g.

$$\text{MM} + \text{CD} + \text{C} + \text{XL}$$

$$\text{M} + \text{D} + \text{D} + \text{D} + \text{XL}$$

Which is the odd one out?

680,000	680 thousands	68 ten-thousands
---------	---------------	------------------

5 hundred-thousands plus 180 thousands	680 hundreds
--	--------------

680 hundreds is the odd one out, as it is equal to 68,000

The rest are equal to 680,000

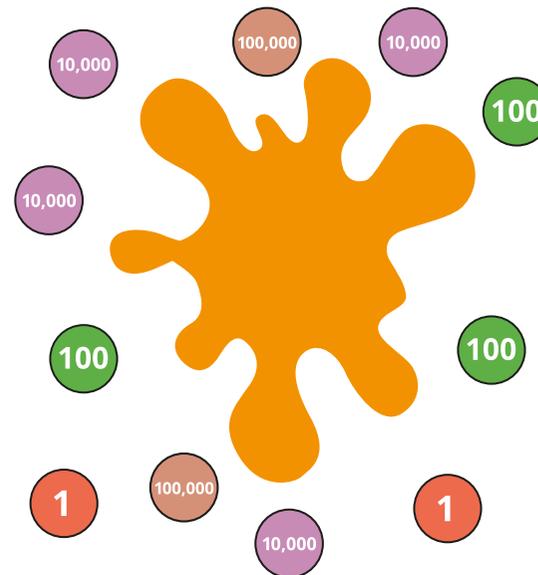
Some of the place value counters are hidden.



The total value of the counters is 265,312

What place value counters could be hidden?

Find at least three solutions.



any set of counters that add up to 25,010 multiple possible answers, e.g.

- two 10,000 counters, five 1,000 counters and one 10 counter
- twenty-five 1,000 counters and one 10 counter
- two 10,000 counters, three 1,000 counters, twenty 100 counters and one 10 counter

Number line to 1,000,000

Notes and guidance

This step begins with a recap of number lines to 10,000, before moving on to explore number lines up to 100,000 and 1,000,000

Children label partially completed number lines, identify points labelled on number lines and show where a given number would lie on a number line. They look at both the exact placement of multiples of 10,000 or 100,000 and the approximate placement of numbers such as 245,678

Recognising the value of the midpoint between two multiples on a number line is key to their understanding and will support the use of number lines when rounding numbers in later steps.

Things to look out for

- Where number lines have more than one set of divisions, children may mix up the intervals between large divisions and smaller divisions.
- Children may confuse the number of intervals and the number of divisions.
- Children may not use the correct multiples when looking at midpoints, for example thinking the midpoint between 1,000 and 2,000 is 1,005

Key questions

- What are the values at the start and the end of the number line?
- How many large intervals are there in the whole number line? What is each large interval worth?
- How many small intervals are there between each of the large intervals on the number line? What is each small interval worth?
- What is the midpoint between _____ and _____?

Possible sentence stems

- The difference in value between the start and end point is _____
- There are _____ intervals.
- The number line is counting up in _____

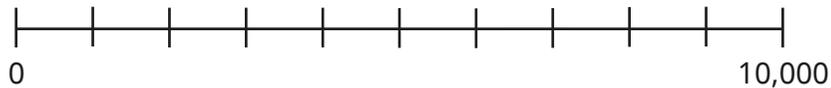
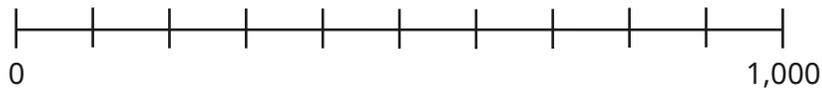
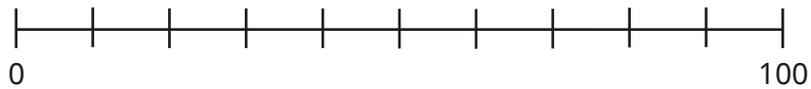
National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
- Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000

Number line to 1,000,000

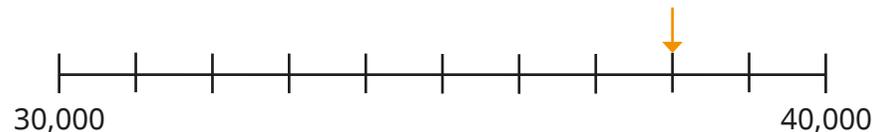
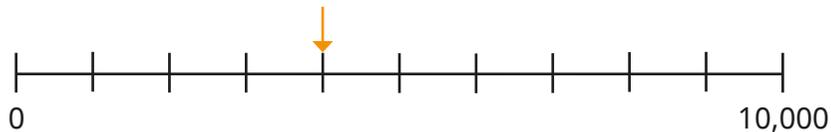
Key learning

- Label the number lines.

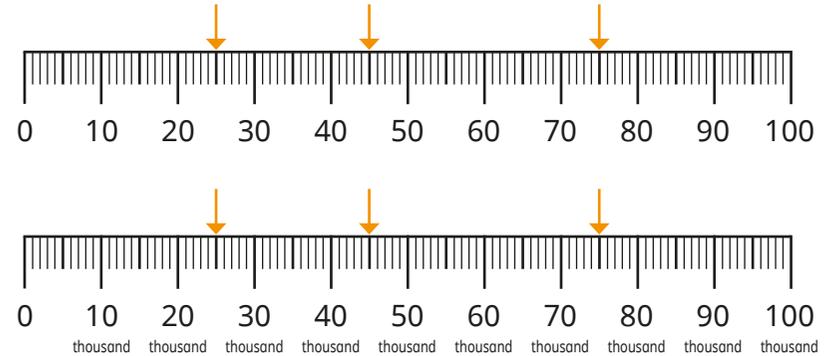


What is the same? What is different?

- What numbers are the arrows pointing to?

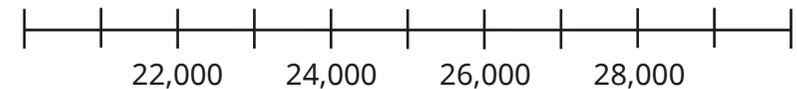


- What numbers are the arrows pointing to?



What is the same about the number lines? What is different?

- Label the start and end points on the number line.



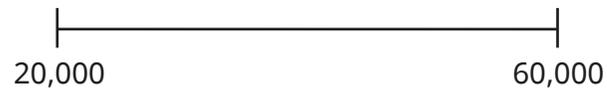
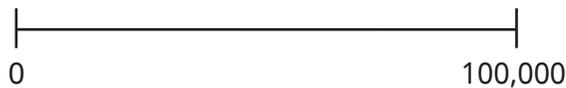
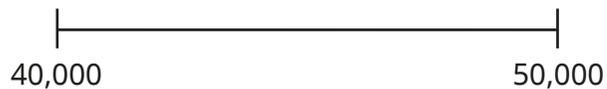
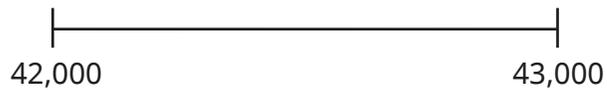
- Draw arrows on the number line to show:

- the exact position of 60,000
- the approximate position of 35,000
- the approximate position of 82,369

Number line to 1,000,000

Reasoning and problem solving

Estimate the position of 42,500 on each number line.

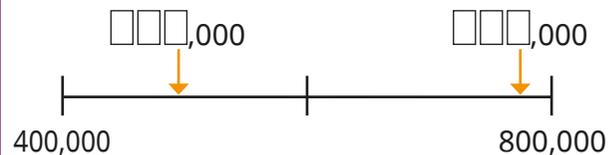
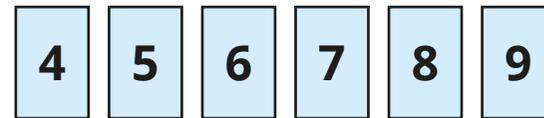
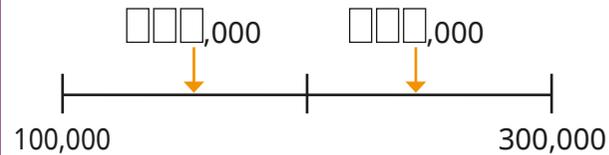


Explain your method.



Children should draw an arrow to the approximate position on each number line and be able to explain their reasoning.

Use the digit cards to complete the labels on the number lines.



multiple possible answers, e.g.

156,000 and
243,000

496,000 and
785,000

Compare and order numbers to 100,000

Notes and guidance

In this small step, children build on their learning of comparing and ordering numbers in earlier years to compare and order numbers up to 100,000

They can use a variety of representations to help them, such as place value counters, place value charts and number lines, but the main focus of the step is to compare and order using the place value of the digits within the numbers. Children first compare pairs of numbers and then move on to ordering sets of three or more numbers.

This small step provides an opportunity to revisit previous learning from this block, as children could be asked to compare and order numbers that are written in Roman numerals.

Things to look out for

- Children may only look at the digits and not consider the place value of the digits within the numbers.
- Where numbers have a different number of digits, children may only look at the first digit.
- Children often confuse the 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 their 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

- The first place value column I need to look at is _____
- _____ is greater/less than _____, so _____ is greater/less than _____

National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit

Compare and order numbers to 100,000

Key learning

- Identify the greater number in each pair.
 - ▶ 63 and 68
 - ▶ 63,000 and 68,000
 - ▶ 63,912 and 68,002

What is the same and what is different?

- Which is the greater number?

TTh	Th	H	T	O
2	2	2	6	6

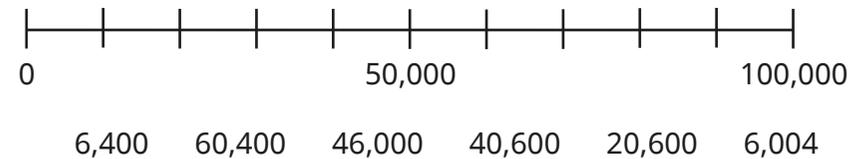
- Write $<$, $>$ or $=$ to make the statements correct.

45,000 54,000

10,160 9,999

65,000 60,700

- Put the numbers in order, starting with the smallest.
You can use the number line to help you.



- Use six counters to make five different 5-digit numbers.

TTh	Th	H	T	O

Order your numbers from greatest to smallest.

- Write the numbers in ascending order.

34,706	MMMDCXL	3,099
5,000 more than thirty thousand	thirty-three thousand and thirty-three	

Compare and order numbers to 100,000

Reasoning and problem solving



Any 6-digit whole number is greater than all 5-digit whole numbers.

Do you agree with Dexter?
Explain your answer.



Yes

Here are six digit cards.

7	2	5	1	9	3
---	---	---	---	---	---

Using five of the digits, what is the greatest number you can make?

Using all six digits, what is the smallest number you can make?

97,532

123,579



Use the digit cards to make three different 5-digit numbers that match the clues.

0	1	2	3	4
5	6	7	8	9

- The digit in the ones column and the digit in the hundreds column have a difference of 2
- The digit in the hundreds column and the digit in the ten-thousands column have a difference of 2
- The sum of all the digits in the number is 19

Write your numbers in ascending order.

multiple possible answers, e.g.

18,325

47,260

56,341

Compare and order numbers to 1,000,000

Notes and guidance

In this small step, children build on the previous step to compare and order numbers up to 1,000,000

The representations used previously can continue into this step; however, the focus will shift more towards number lines as they are more efficient when representing numbers of increasing value.

Encourage children to make connections between the position of numbers on a number line and their value. They should recognise that when working on horizontal number lines, numbers further to the right have a greater value. Word problems involving real-world examples, such as comparing populations, are also introduced.

Things to look out for

- Children may only look at the digits and not consider the place value of the digits within the numbers.
- Children may need to be reminded of the meanings of the inequality symbols as well as the words “ascending” and “descending”.
- Placeholders can cause difficulty when working with larger numbers.

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 their 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

- The first place value column I need to look at is _____
- _____ is greater/less than _____, so _____ is greater/less than _____

National Curriculum links

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit

Compare and order numbers to 1,000,000

Key learning

- Identify the greater number in each pair.

▶	59	51
▶	59,000	51,000
▶	590,000	510,000

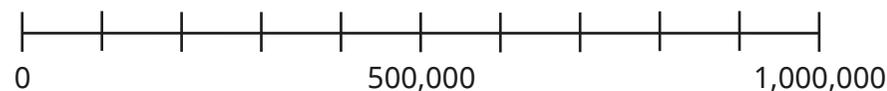
What is the same and what is different?

- Write $<$, $>$ or $=$ to make the statements correct.

450,000	○	540,000	101,600	○	99,999
650,000	○	607,000	312,007	○	312,070

- Put the numbers in ascending order.

You can use the number line to help you.



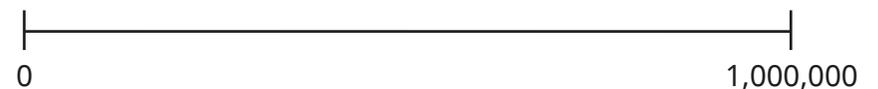
64,000	604,000	460,000	40,600	200,600	6,004
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- The table shows the populations in some towns and cities in Yorkshire.

List the towns and cities in descending order of population.

Town or city	Population
Halifax	88,134
Brighouse	32,360
Leeds	792,925
Huddersfield	146,234
Wakefield	343,932
Bradford	536,986

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



- A four hundred and ten thousand
- B 95,770
- C half a million
- D eight hundred thousand

Write the numbers in ascending order.

Compare and order numbers to 1,000,000

Reasoning and problem solving

Here are four number cards.

101,080	one hundred thousand
one thousand one hundred	99,280

Mo, Annie and Ron each choose a card.



My number has the greatest value.

Mo



My number has 8 tens.

Annie



My number is greater than Annie's but less than Mo's.

Ron

one thousand one hundred

Which card is left over?

Write $<$, $>$ or $=$ to make the statements correct.

$600,000 + 80,000$ $618,000$

10,000 less than 723,000 722,000

999,999 one million

50,000 half a million

20 ten-thousands 200 thousands

$>$

 $<$

 $<$

 $<$

 $=$

Round to the nearest 10, 100 or 1,000

Notes and guidance

In this small step, children build on their knowledge of rounding to the nearest 10, 100 and 1,000 from Year 4, now also rounding numbers beyond 10,000 to these degrees of accuracy.

It is important that children hear and use the language of “rounding to the nearest” rather than “rounding up” and “rounding down”, as this can lead to errors. Number lines are a particularly useful tool to support this, as children can see which multiples of 10, 100 or 1,000 the given numbers are closer to. It is worth discussing with children the convention that when there is a 5 in the relevant place value column, despite being exactly halfway between the two multiples, we round to the next one.

Things to look out for

- Children may not round to the correct degree of accuracy, for example rounding to the nearest 100 instead of the nearest 1,000
- Children may be confused by the language “round down”/“round up” and thus round 72,160 to 71,000 (or 71,160) when asked to round to the nearest 1,000
- Children may look at the thousands digit rather than the hundreds when rounding to the nearest 100

Key questions

- Which multiples of 10/100/1,000 does the number lie between?
- Which multiple on the number line is the number closer to?
- What is the number rounded to the nearest 10/100/1,000?
- Which place value column should you look at to round the number to the nearest 10/100/1,000?
- What happens when a number is exactly halfway between two numbers on a number line?

Possible sentence stems

- The previous multiple of 10/100/1,000 is _____
- The next multiple of 10/100/1,000 is _____
- _____ is closer to _____ than _____
- _____ rounded to the nearest 10/100/1,000 is _____

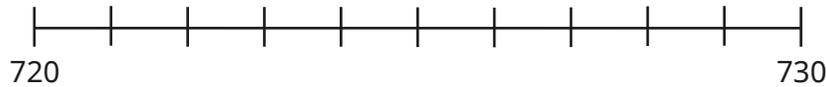
National Curriculum links

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

Round to the nearest 10, 100 or 1,000

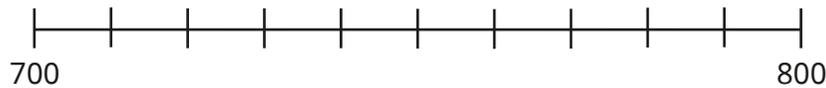
Key learning

- Mark the position of 728 on the number line.



Use the number line to round 728 to the nearest 10

Now estimate the position of 728 on this number line.



Use the number line to round 728 to the nearest 100

- Between which two multiples of 1,000 does the number 6,741 lie?

What is 6,741 rounded to the nearest 1,000?

- 3,500 is exactly halfway between 3,000 and 4,000

What is 3,500 rounded to the nearest 1,000?

- 8,317 people attend a pop concert.

Round the number of people at the concert to the nearest 10

Round the number of people at the concert to the nearest 100

Round the number of people at the concert to the nearest 1,000

- 31,409 people attend a football match.

Round the number of people at the match to the nearest 100

Round the number of people at the match to the nearest 1,000



- Eva runs every night for a week.

Altogether she runs 28,650 m.

Round the distance she runs to the nearest 100 m.

Round the distance she runs to the nearest kilometre.

- Which numbers round to 4,600 to the nearest 100?

4,620	4,605	4,590	4,545	4,499	4,650
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Round to the nearest 10, 100 or 1,000

Reasoning and problem solving




My number rounded to the nearest 10 is 1,150
Rounded to the nearest 100, my number is 1,200

1,150, 1,151, 1,152
1,153, 1,154

Find all the possible whole number values of Dora's number.



When rounded to the nearest 10, a number is 50
When rounded to the nearest 100, the number is zero.
Find all the possible whole number values of the number.

45, 46, 47, 48, 49



4,725 rounded to the nearest 1,000 is 5,025

When rounding to the nearest 1,000, the answer must be a multiple of 1,000
The correct answer is 5,000

Explain why Tiny is wrong.



Mo is thinking of a number.

- The number is 5,000 when rounded to the nearest 1,000
- The number is also 5,000 when rounded to the nearest 100
- The number is also 5,000 when rounded to the nearest 10
- The number is not 5,000

What is the greatest possible value of the number?

5,004

Round within 100,000

Notes and guidance

In this small step, children build on their learning in the previous step to round any number within 100,000 to the nearest 10, 100, 1,000 or 10,000. Rounding to the nearest 10,000 is the new learning.

They should be confident with multiples of 10,000 from earlier steps in this block, and the process of rounding is also familiar. Children need to realise that the midpoint of two multiples of 10,000 ends in 5,000, so they need to look at the digit in the thousands column to determine how to round the number.

As in the previous steps, be careful with the language of “round up” and “round down” in case children mistakenly change the wrong digits when rounding.

Things to look out for

- Children may not look at the correct column to make their decisions about rounding, for example rounding 24,555 to 30,000 to the nearest 10,000 as they have misapplied the rule “5 or more rounds up”.
- Children may be confused by the language “round down”/“round up”, for example rounding 78,564 to 88,564 to the nearest 10,000

Key questions

- Which multiples of 10,000 does the number lie between?
- Which division on the number line is the number closer to?
- What is the number rounded to the nearest 10,000?
- Which place value column should you look at to round the number to the nearest 10/100/1,000/10,000?
- What happens if a number lies exactly halfway between two multiples of 10,000?

Possible sentence stems

- The previous multiple of 10,000 is _____
- The next multiple of 10,000 is _____
- _____ is closer to _____ than _____
- _____ rounded to the nearest 10,000 is _____

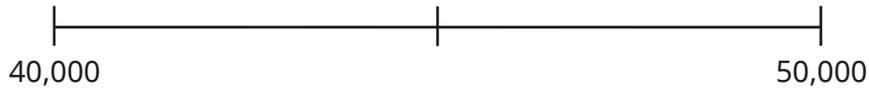
National Curriculum links

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

Round within 100,000

Key learning

-



What number is halfway between 40,000 and 50,000?

Draw an arrow to show the approximate position of 48,725 on the number line.

Round 48,725 to the nearest 10,000

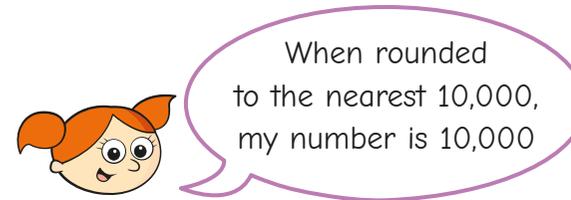
- Round 86 and 174 to the nearest 10
Round 86,000 and 174,000 to the nearest 10,000
What is the same and what is different?

- Round each number to the nearest 10,000

41,000	41,900
41,009	41,999
41,090	4,199

What is the same and what is different?

- The circumference of Earth is 24,901 miles.
Round this distance to the nearest 1,000 miles.
Round this distance to the nearest 10,000 miles.
Which is the better approximation to use?
- Alex is thinking of a number.



Which of these numbers could be Alex's number?

8,000	18,000	12,000	2,000	5,000
15,000	1,500	4,999	14,999	

Explain how you know.

Round within 100,000

Reasoning and problem solving

Here is a newspaper headline about a football match.



Do you think exactly 60,000 people watched the football match?

What is the smallest number of people who watched the match, if the number in the headline has been:

- rounded to the nearest 10,000
- rounded to the nearest 1,000
- rounded to the nearest 100?

The headline is probably not an exact value.

- 55,000
- 59,500
- 59,950

The difference between two 5-digit numbers is 5

When the numbers are rounded to the nearest 1,000, the difference is 1,000

What could the numbers be?



any two 5-digit numbers with a difference of 5 where the last three digits are between 496 and 504, for example 52,498 and 52,503

By rounding both numbers to the nearest 10,000, estimate the answer to the calculation.

$$47,826 + 88,112$$

Is your estimate greater than or less than the actual answer?

How do you know?



140,000
greater

Round within 1,000,000

Notes and guidance

Building on the previous two steps, children now round any number up to 1,000,000 to any power of 10 up to 100,000. This is the first time that children round to the nearest 100,000

You may wish to practise counting in 100,000s first, and then practise rounding to the nearest 100,000 before looking at mixed questions.

It is worth discussing which approximations are most appropriate, for example why we would not give the population of a city to the nearest 10 or the population of a small town to the nearest 100,000

Things to look out for

- Children may not look at the correct column to make their decisions about rounding, for example rounding 245,555 to 300,000 to the nearest 100,000 as they have misapplied the rule “5 or more rounds to the next multiple”.
- Children may be confused by the language “round down”/“round up”, for example rounding 428,513 to 328,513 (or 300,000) to the nearest 100,000
- Children may not round to the required degree of accuracy, for example misreading “round to the nearest 100,000” as “round to the nearest 100”.

Key questions

- Which multiples of 100,000 does the number lie between?
- How can you represent the rounding of this number on a number line?
- Which division on the number line is the number closer to?
- What is the number rounded to the nearest 100,000?
- What is the most appropriate way of rounding this number?
- What place value column should you look at to round the number to the nearest 10/100/1,000/10,000/100,000?

Possible sentence stems

- The previous multiple of 100,000 is _____
- The next multiple of 100,000 is _____
- _____ is closer to _____ than _____
- _____ rounded to the nearest 100,000 is _____

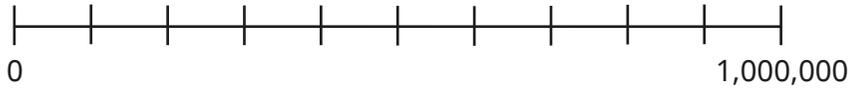
National Curriculum links

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

Round within 1,000,000

Key learning

- Complete the number line.



Between which two multiples of 100,000 does 735,292 lie?

Round 735,292 to the nearest 100,000

- The table shows the masses of some famous statues.

Statue	Mass
Statue of Liberty	201,400 kg
Christ the Redeemer	635,000 kg
Spring Temple Buddha	987,000 kg
Mustang Stone Buddha	58,000 kg

Round the mass of each statue to the nearest 10,000 kg.

Round the mass of each statue to the nearest 100,000 kg.

- The average distance of the Moon from Earth is 384,389 km.

Round this distance to the nearest 1,000 km.

Round this distance to the nearest 10,000 km.

Round this distance to the nearest 100,000 km.

Which do you think is the most appropriate number to round the distance to?

- The greatest ever attendance at a football match was the World Cup final between Brazil and Uruguay in 1950

173,850 people watched the game.

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

Which do you think is the most appropriate number to round the attendance to?

-



My number is 800,000 when rounded to the nearest 100,000

What is the greatest integer Amir could be thinking of?

What is the smallest integer Amir could be thinking of?

Round within 1,000,000

Reasoning and problem solving

The difference between two 5-digit numbers is 200

When each number is rounded to the nearest 100,000, the difference between them is 100,000

What could the two numbers be?

Find all the possible answers.

49,900 and 50,100

49,800 and 50,000

328,154 people buy tickets for a festival.

Tickets are printed in batches of 10,000

How many batches of tickets should the organisers print?



33 batches

A, B and C are three different whole numbers.

- When the difference between A and B is rounded to the nearest 100, the answer is 700
- When the difference between B and C is rounded to the nearest 100, the answer is 400
- None of the numbers are multiples of 10

Find a possible set of values for A, B and C.

Compare answers with a partner.

Are your values of A, B and C in the same order greatest to smallest?

Are your differences smaller or greater?

A – B (or B – A) is between 650 and 749

B – C (or C – B) is between 350 and 449

multiple possible answers, e.g.

A = 1,199

B = 450

C = 1

A = 651

B = 1

C = 351

Autumn Block 2

Addition and subtraction

Small steps

Step 1

Mental strategies

Step 2

Add whole numbers with more than four digits

Step 3

Subtract whole numbers with more than four digits

Step 4

Round to check answers

Step 5

Inverse operations (addition and subtraction)

Step 6

Multi-step addition and subtraction problems

Step 7

Compare calculations

Step 8

Find missing numbers

Mental strategies

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

National Curriculum links

- Add and subtract numbers mentally with increasingly large numbers

Mental strategies

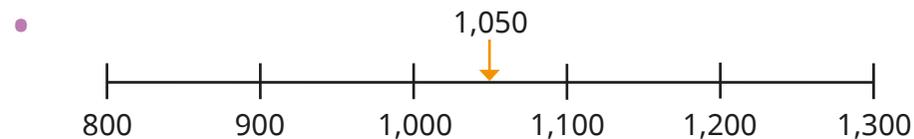
Key learning

- Use the fact that $8 + 4 = 12$ to work out the additions.
 - $8,000 + 4,000$
 - $800 + 400$
 - $80,000 + 40,000$
- Find the sum of each pair of numbers.
 - $300,000$ and $400,000$
 - $62,000$ and $6,000$
 - $110,000$ and $230,000$
 - $5,020$ and $9,060$

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

TTh	Th	H	T	O
● ● ●	● ● ● ● ● ● ● ●	● ● ● ● ● ●	● ● ● ● ●	

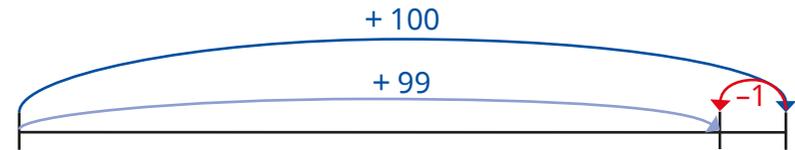
- $48,650 - 3,000$
 - $43,650 - 200$
 - $43,650 - 10$
 - $48,650 - 3,210$
 - $48,650 - 7,100$
 - $48,650 - 5,030$



Use the number line to help you work out the calculations.

- $1,050 + 100$
 - $1,050 - 100$

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



Use the number line to help you add 99 to 687

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

- Work out the calculations.

$3,724 + 999$	$3,724 - 999$
$3,724 + 990$	$3,724 - 990$

- Work out the calculations.

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

What mental strategies did you use?

Mental strategies

Reasoning and problem solving

Tiny is using mental strategies to add numbers.

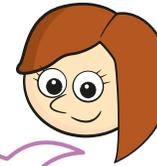
I know
 $800 + 300 = 1,100$,
 so $4,826 + 300 = 41,126$



Explain why Tiny is wrong.
 Find the correct answer to
 $4,826 + 300$

5,126

Rosie is working out a subtraction.



$1,000 - 372 = 999 - 371$

Explain why Rosie is correct.

Work out the answer to
 $1,000 - 372$

Use this strategy to work out the subtractions.

$1,000 - 625$

$10,000 - 6,832$

$100,000 - 47,356$

628

375

3,168

52,644

Add whole numbers with more than four digits

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

National Curriculum links

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

Add whole numbers with more than four digits

Key learning

- Use the column method to work out the additions.

		4	7	
	+	3	8	

		2	4	7
	+	5	3	8

		3	6	4	7
	+	4	9	2	8

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

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

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

Use Ron's method to work out the additions.

$32,461 + 4,352$

$48,276 + 5,613$

- Jack, Kim and Eva are playing a computer game.

- Jack has 3,452 points.
- Rosie has 4,039 points.
- Eva has 10,989 points.

How many points do Jack and Rosie have altogether?

How many points do Rosie and Eva have altogether?

How many points do Jack and Eva have altogether?

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

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

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

$12,724 + 43,610$

$63,800 + 2,002$

$9,999 + 8,712$

$313,500 + 89,019$

Add whole numbers with more than four digits

Reasoning and problem solving

Work out the missing numbers.

			4		3			
+	2		5		2			
	7	8	5	2	9			

$$\begin{array}{r} 54,937 \\ + 23,592 \\ \hline 78,529 \end{array}$$

What mistake has been made?



$$1,562 + 301 = 4,572$$

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

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

My 6-digit number rounds to 200,000 to the nearest 10,000
I have rounded my 5-digit number to the nearest 1,000
My estimate of the total is one-quarter of a million.



- What could Dexter's numbers be?
- What is the greatest possible total of Dexter's numbers?
- What is the smallest possible total of Dexter's numbers?

6-digit number: between 195,000 and 204,999
5-digit number: between 49,500 and 50,499

$$255,498$$

$$244,500$$

Subtract whole numbers with more than four digits

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

National Curriculum links

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

Subtract whole numbers with more than four digits

Key learning

- Use the column method to work out the subtractions.

		8	4		
	-	3	6		
		<hr/>			
		<hr/>			

		6	3	2		
	-	4	1	7		
		<hr/>				
		<hr/>				

		4	6	8		
	-	2	9	3		
		<hr/>				
		<hr/>				

		3	1	2	5	
	-	2	4	1	7	
		<hr/>				
		<hr/>				

- Work out the subtraction.

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

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

		4	5	5	3	6	
	-		8	4	2	6	
		<hr/>					
		<hr/>					

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

31,547 of the fans are adults.

How many of the fans are not adults?

- The population of Hereford is 63,689

The population of Chester is 87,593

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

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

- Find the answers to the calculations.

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

12,000 - 2

46,312 - 15,000

35,295 - 16,359

90,000 - 23,518

Subtract whole numbers with more than four digits

Reasoning and problem solving

Work out the missing numbers.

		5		4		8	
	-		1		2		
		2	0	8	5	8	

$$\begin{array}{r} 52,478 \\ - 31,620 \\ \hline 20,858 \end{array}$$

$$623 + 754 = 1,377$$

Use the calculation to complete the number sentences.

$$\underline{\hspace{2cm}} - 754 = 623$$

$$\underline{\hspace{2cm}} - 6,230 = 7,540$$

$$137,700 - 75,400 = \underline{\hspace{2cm}}$$

1,377

13,770

62,300

Work out the missing numbers.



		6		2		6	
	-		8		7		
		3	6	7	4	4	

$$\begin{array}{r} 65,216 \\ - 28,472 \\ \hline 36,744 \end{array}$$



Tiny is working out a subtraction.



$$53,209 - 27,452 = 34,257$$

What mistake has Tiny made?

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

Round to check answers

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

National Curriculum links

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

Round to check answers

Key learning

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

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

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

The estimated total is _____ + _____ = _____

Compare the estimate with the actual answer.

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

$$517,000 + 289,000$$

$$517,000 - 289,000$$

$$126,539 + 723,628$$

$$809,375 - 610,005$$

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

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

Compare Annie's method with Jack's method.

Work out the actual answer. Which estimate was closer?

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

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

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

Use an estimate to check your answer.

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

Estimate the number of tickets sold in May.

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



Mrs Khan has £1,700

Estimate whether she can afford all three items.

Round to check answers

Reasoning and problem solving

Mo has completed an addition.

$$31,207 + 6,529 = 96,497$$

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

$$30,000 + 7,000 = 37,000$$

Mo's answer is too big.

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

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

What is the smallest possible actual total of the numbers?

What is the greatest possible actual total of the numbers?

$$90,000 \text{ (e.g. } 65,000 + 25,000)$$

$$109,998 \text{ (e.g. } 54,999 + 54,999)$$

Tommy, Amir and Whitney are working out a subtraction.

$$64,942 - 59,713$$



I estimate the answer is 5,000

Tommy

I estimate the answer is zero.



Amir



I estimate the answer is 5,230

Whitney

Explain why the children all have different estimates.

Work out the actual answer.

Whose estimate is most accurate?

They rounded the numbers to different powers of 10

5,229

Whitney's

Inverse operations (addition and subtraction)

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

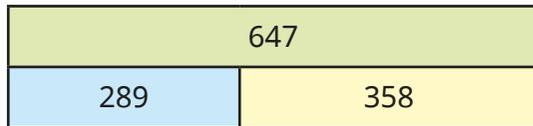
National Curriculum links

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

Inverse operations (addition and subtraction)

Key learning

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



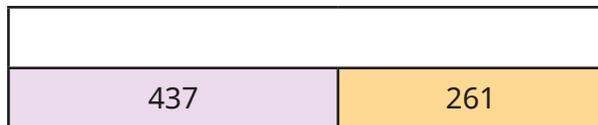
- Aisha works out an addition.

$$65 + 78 = 143$$

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

- | | | | |
|------------|-----------|------------|------------|
| $143 - 78$ | $78 - 65$ | $143 - 65$ | $78 - 143$ |
|------------|-----------|------------|------------|

- Complete the bar model.



Check your answer using a subtraction.

- Huan thinks of a number. He adds 17 to his number and gets the answer 40. Which calculation can be used to find Huan's number?

- | | | | |
|-----------|-----------|-----------|-----------|
| $17 + 40$ | $17 - 40$ | $40 - 17$ | $40 + 17$ |
|-----------|-----------|-----------|-----------|

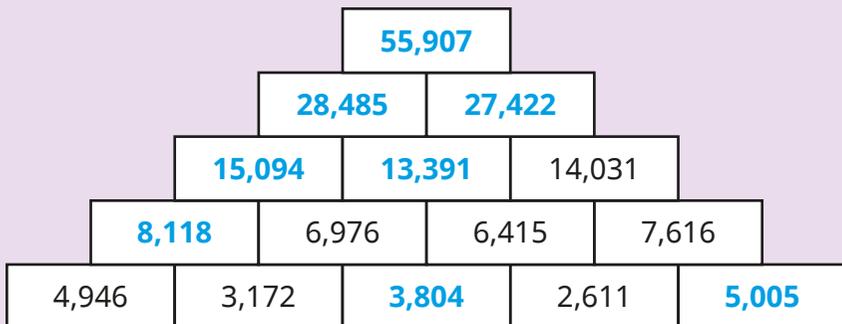
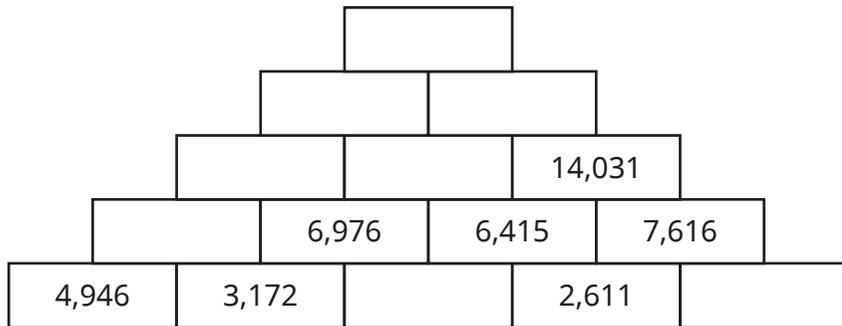
- Esther and Brett are playing a computer game. Esther scores 8,524 points. The total of both their scores is 19,384. How many points did Brett score?
 - Dani thinks of a number. After she adds 5,241 and subtracts 352, her new number is 9,485. What was Dani's original number?
 - Find the missing numbers.
 - ▶ $654 + \underline{\quad} = 837$ ▶ $\underline{\quad} - 719 = 424$
 - ▶ $3,820 = 5,260 - \underline{\quad}$ ▶ $19,456 = 2,345 + \underline{\quad}$
- Use inverse operations to check your answers.

Inverse operations (addition and subtraction)

Reasoning and problem solving

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

Use addition and subtraction to complete the pyramid.



Teddy and Alex are each thinking of a number.



Teddy

98 less than my number is 465



Alex

99 more than my number is 465

$98 + 99 = 197$

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

Multi-step addition and subtraction problems

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

National Curriculum links

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

Multi-step addition and subtraction problems

Key learning

- Filip is writing a report.

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

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

How many more words does Filip need to write?

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

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

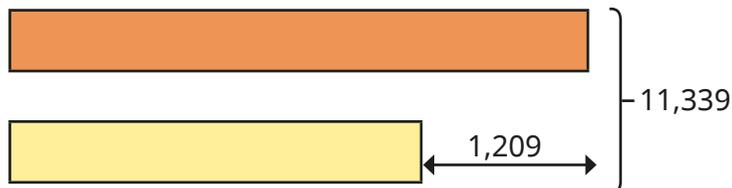
There are 44 people in the Year 5 group and 38 people in the Year 6 group.

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

- The sum of two numbers is 11,339

The difference between the numbers is 1,209

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



- Mr Rose is buying items for his home.

He has a budget of £1,500

washing machine



tumble dryer



dishwasher



He buys a washing machine and a tumble dryer.

Does he have enough money left to buy the dishwasher?

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

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

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

How long is the pole?

- Annie opens a book and sees two numbered pages.

The sum of the page numbers is 317

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

Multi-step addition and subtraction problems

Reasoning and problem solving

A milkman has 250 bottles of milk.



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

Nijah works out how many bottles are left.

$$375 - 250 = 125$$

$$125 + 160 = 285$$

Do you agree with Nijah?
Explain your answer.



No

Mo is twice as old as Jack.

Dora is 3 years younger than Jack.

The sum of all their ages is 33

Jack is 15



Explain the mistake Tiny has made.

How old is Jack?



9 years old

Compare calculations

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

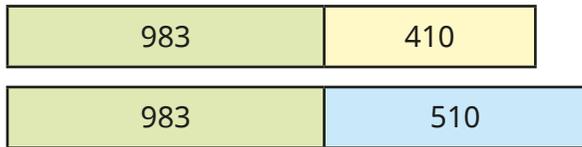
National Curriculum links

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

Compare calculations

Key learning

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



Use the bar model to explain your answer.

- Which calculation has the greater answer?



How do you know?

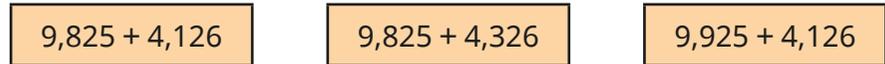
- Write $>$, $<$ or $=$ to complete the calculations.

$$47 + 28 \bigcirc 37 + 28$$

$$64 + 91 \bigcirc 91 + 64$$

$$651 - 286 \bigcirc 651 - 283$$

- Which calculation has the greatest answer?



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



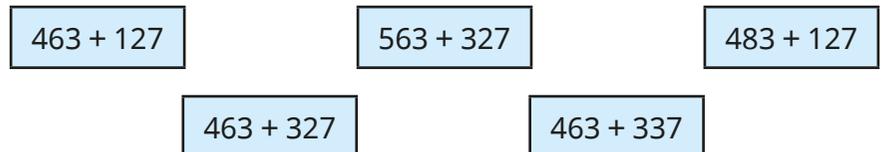
Explain your answers.

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



Explain your answers.

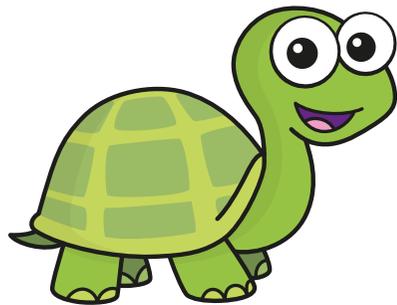
- Put the addition cards in order of size, starting with the one with the greatest answer.



Compare calculations

Reasoning and problem solving

$564 + 478 = 563 + 479$



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

Explain why Tiny is correct.

Which of the calculations have the same answer as $564 - 478$?

$565 - 479$

$563 - 479$

$565 - 477$

$563 - 477$

$565 - 479$

$563 - 477$

$16,853 + 23,671 = 40,524$

Use the addition to work out these calculations.

$16,953 + 23,671$

$16,883 + 23,691$

$40,524 - 16,853$

$42,524 - 16,853$

$40,524 - 17,853$

$405,240 - 236,710$

40,624

40,574

23,671

25,671

22,671

168,530

Compare methods with a partner.



Find missing numbers

Notes and guidance

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

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

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

Things to look out for

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

Key questions

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

Possible sentence stems

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

National Curriculum links

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

Find missing numbers

Key learning

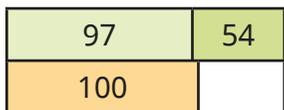
- Complete the calculations.

▶ $\underline{\hspace{2cm}} - 100 = 5,823$ ▶ $\underline{\hspace{2cm}} - 1,000 = 5,823$
 ▶ $5,423 + \underline{\hspace{2cm}} = 5,823$ ▶ $3,623 + \underline{\hspace{2cm}} = 5,823$

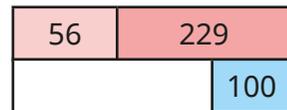
- Complete the calculations.

Use the bar models to help you.

$97 + 54 = 100 + \underline{\hspace{2cm}}$



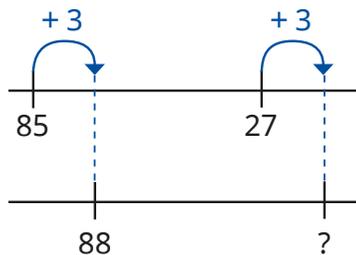
$56 + 229 = \underline{\hspace{2cm}} + 100$



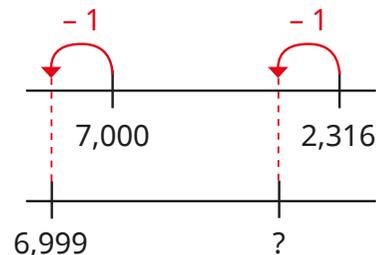
- Complete the calculations.

Use the number lines to help you.

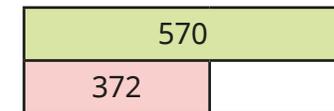
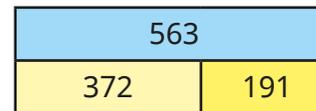
$85 - 27 = 88 - \underline{\hspace{2cm}}$



$7,000 - 2,316 = 6,999 - \underline{\hspace{2cm}}$



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



- Complete the calculations.

▶ $536 + 275 = 540 + \underline{\hspace{2cm}}$ ▶ $536 - 275 = 540 - \underline{\hspace{2cm}}$
 ▶ $3,000 - 513 = 2,999 - \underline{\hspace{2cm}}$ ▶ $2,685 + \underline{\hspace{2cm}} = 2,695 + 3,541$

- Match the calculations that have the same results.

$623 + 418$

$849 - 332$

$725 + 517$

$621 + 420$

$847 - 329$

$848 - 330$

$846 - 329$

$520 + 722$

Find missing numbers

Reasoning and problem solving

$$327 + \square < 700$$

I think the missing number is 473



Explain the mistake Tiny has made.

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

$$48 + 37 > 38 + \triangle$$

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

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

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

any number less than 47

any number greater than or equal to 47

It must be less than 47

Write the missing digits to make the calculations correct.



$$_3_ + _3 = 300$$

$$_3_ - _3 = 300$$

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

$$237 + 63 = 300$$

$$333 - 33 = 300$$

Both calculations have only one possible solution.