Autumn
Scheme of learning
Year 6

#MathsEveryoneCan

The **White Rose Maths** schemes of learning

Teaching for mastery

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

Putting number first

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

Depth before breadth

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

Working together

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

Fluency, reasoning and problem solving

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

Concrete – Pictorial – Abstract (CPA)

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

Concrete

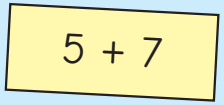
Children should have the opportunity to work with physical objects/concrete resources, in order to bring the maths to life and to build understanding of what they are doing.

Pictorial

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

Abstract

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



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

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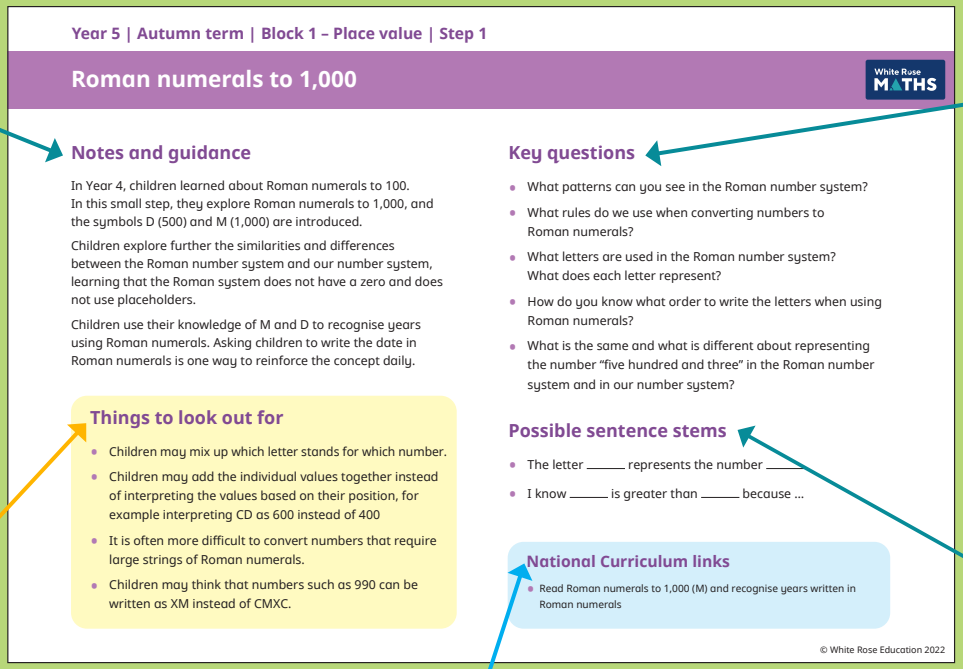
Teacher guidance

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

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



Year 5 | Autumn term | Block 1 – Place value | Step 1

Roman numerals to 1,000

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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

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

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

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

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

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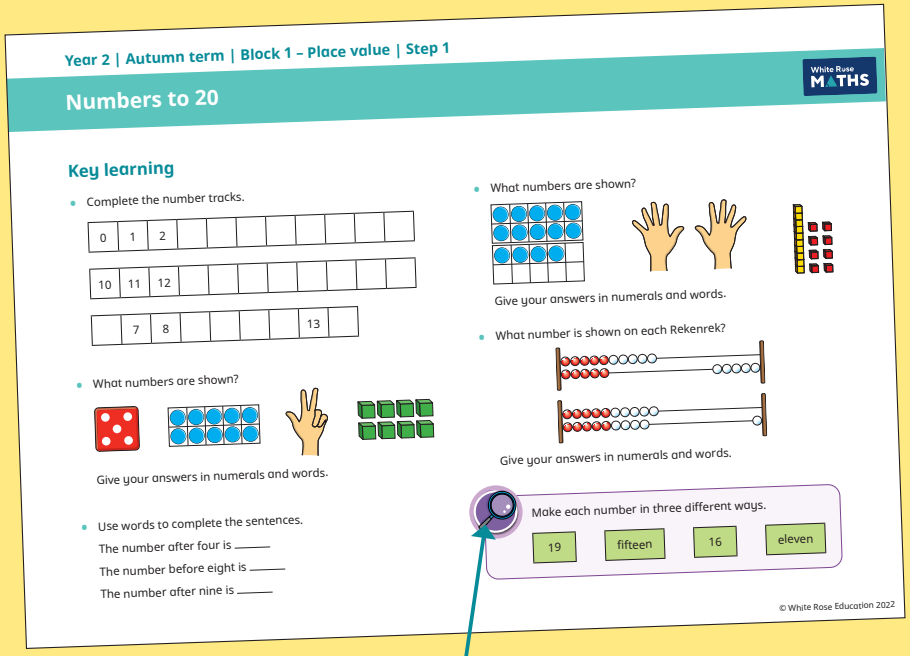
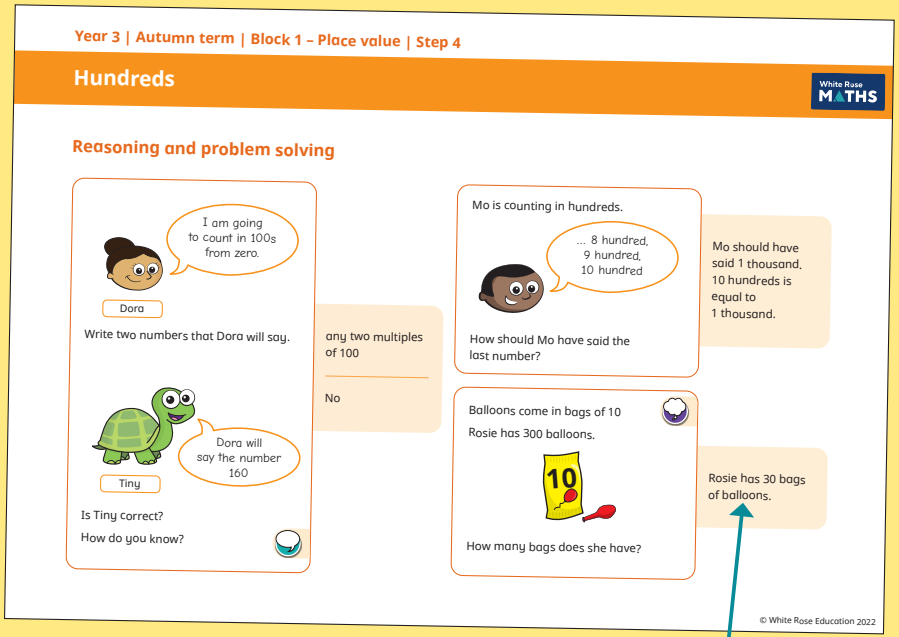
Teacher guidance

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



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.



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.

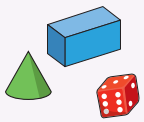
Give children a selection of buttons and ask them to sort the buttons in as many different ways as they can.

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

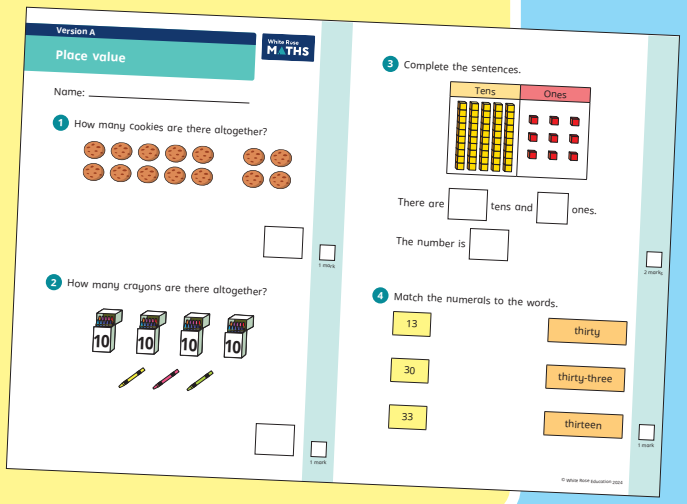
drawing a picture might help children to answer the question

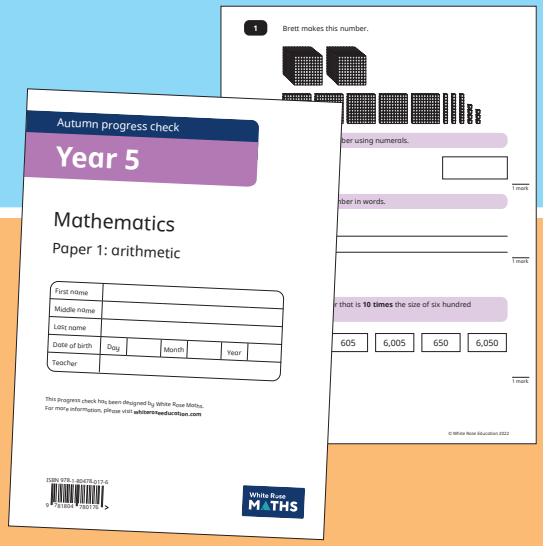
children talk about and compare their answers and reasoning

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

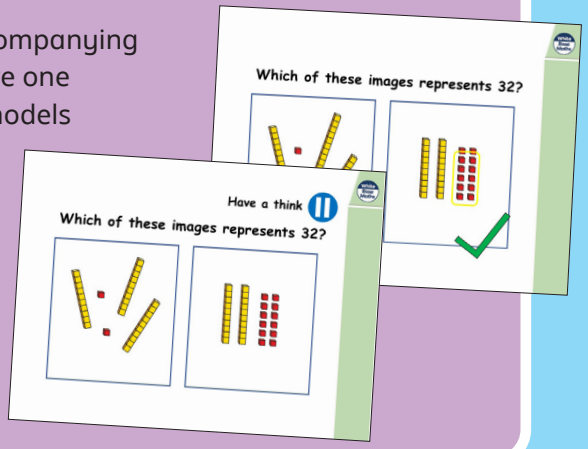
End-of-block assessments to check progress and identify gaps in knowledge and understanding.





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.



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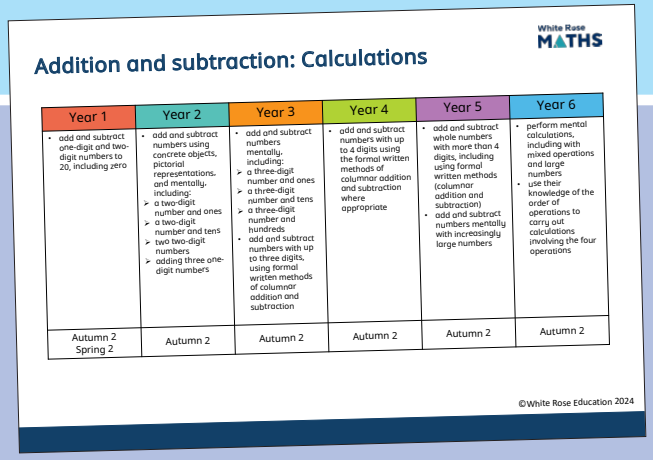
Free supporting materials



Addition and subtraction: Calculations

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Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
• add and subtract one-digit and two-digit numbers to 20, including zero	• add and subtract numbers using concrete objects, pictorial representations, and mentally, including: ➢ a two-digit number and ones ➢ a two-digit number and tens ➢ two two-digit numbers ➢ adding three one-digit numbers	• add and subtract numbers mentally, including: ➢ a three-digit number and ones ➢ a three-digit number and tens ➢ a three-digit number and hundreds • add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	• add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate	• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers	• perform mental calculations, including with mixed operations and large numbers • use their knowledge of the order of operations to carry out calculations involving the four operations
Autumn 2 Spring 2	Autumn 2	Autumn 2	Autumn 2	Autumn 2	Autumn 2

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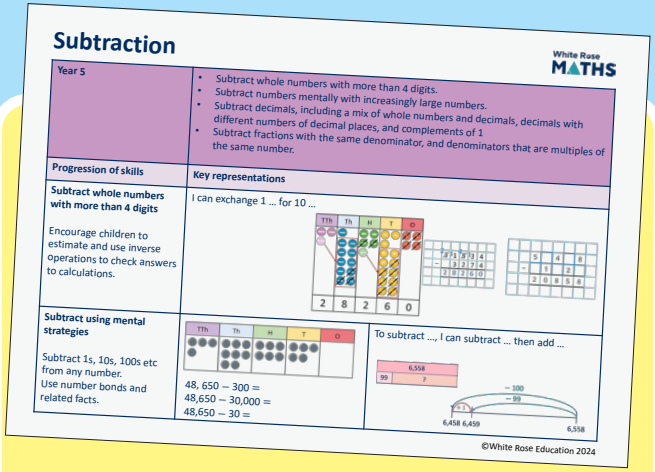
National Curriculum progression to indicate how the schemes of learning fit into the wider picture and how learning progresses within and between year groups.



Subtraction

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Year 5	• Subtract whole numbers with more than 4 digits. • Subtract numbers mentally with increasingly large numbers. • Subtract decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 • Subtract fractions with the same denominator, and denominators that are multiples of the same number.
Progression of skills	**Key representations**
Subtract whole numbers with more than 4 digits Encourage children to estimate and use inverse operations to check answers to calculations.	I can exchange 1 ... for 10 ...
Subtract using mental strategies Subtract 1s, 10s, 100s etc from any number. Use number bonds and related facts.	48, 650 − 300 = 48,650 − 30,000 = 48,650 − 30 = To subtract ..., I can subtract ... then add ...

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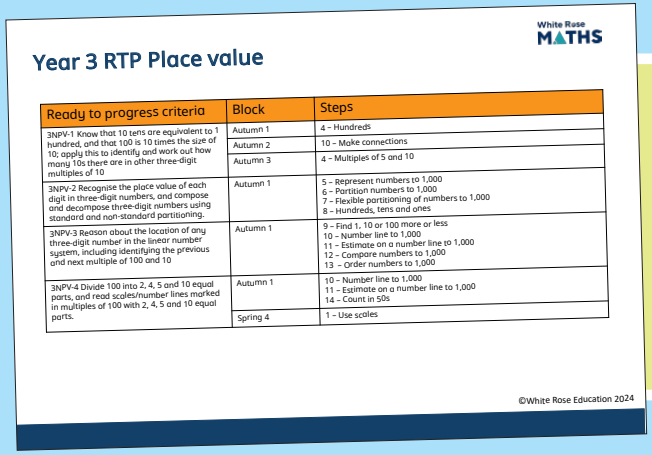
Calculation policies that show how key approaches develop from Year 1 to Year 6.



Year 3 RTP Place value

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Ready to progress criteria	Block	Steps
3NPV-1 Know that 10 tens are equivalent to 1 hundred, and that 100 is 10 times the size of 10; apply this to identify and work out how many 10s there are in other three-digit multiples of 10	Autumn 1	4 – Hundreds
	Autumn 2	10 – Make connections
	Autumn 3	4 – Multiples of 5 and 10
3NPV-2 Recognise the place value of each digit in three-digit numbers, and compose and decompose three-digit numbers using standard and non-standard partitioning.	Autumn 1	5 – Represent numbers to 1,000 6 – Partition numbers to 1,000 7 – Flexible partitioning of numbers to 1,000 8 – Hundreds, tens and ones
3NPV-3 Reason about the location of any three-digit number in the linear number system, including identifying the previous and next multiple of 100 and 10	Autumn 1	9 – Find 1, 10 or 100 more or less 10 – Number line to 1,000 11 – Estimate on a number line to 1,000 12 – Compare numbers to 1,000 13 – Order numbers to 1,000
3NPV-4 Divide 100 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in multiples of 100 with 2, 4, 5 and 10 equal parts.	Autumn 1	10 – Number line to 1,000 11 – Estimate on a number line to 1,000 14 – Count in 50s
	Spring 4	1 – Use scales

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

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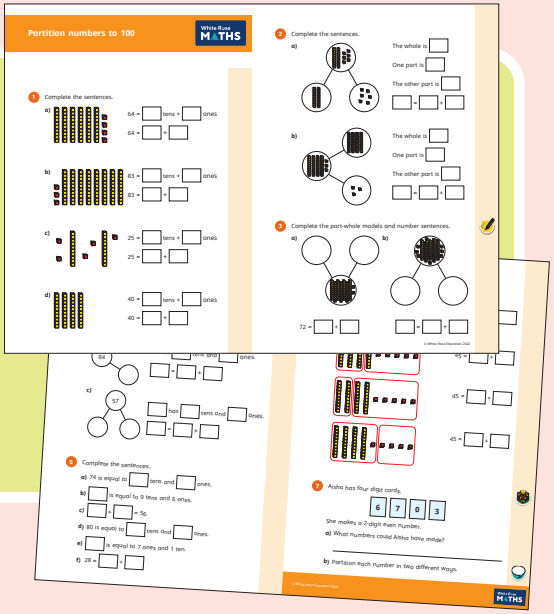
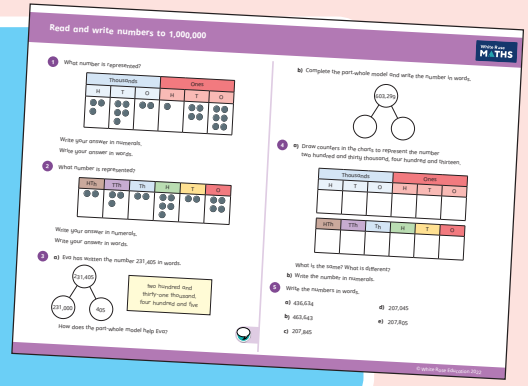
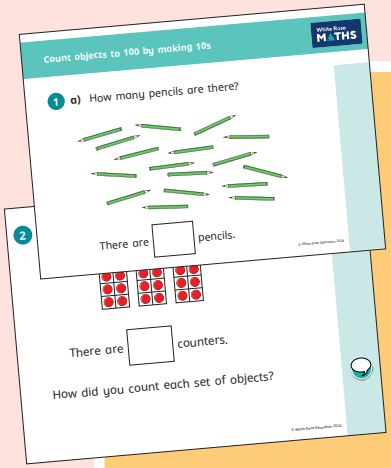
Premium supporting materials

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



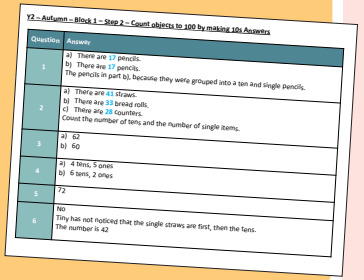
Display versions of the worksheet questions for front of class/whole class teaching.

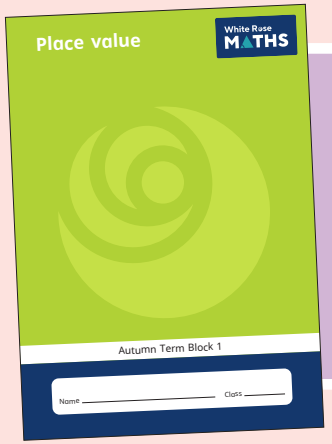




PowerPoint™ versions of the worksheet questions to incorporate them into lesson planning.

Answers to all the worksheet questions.





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

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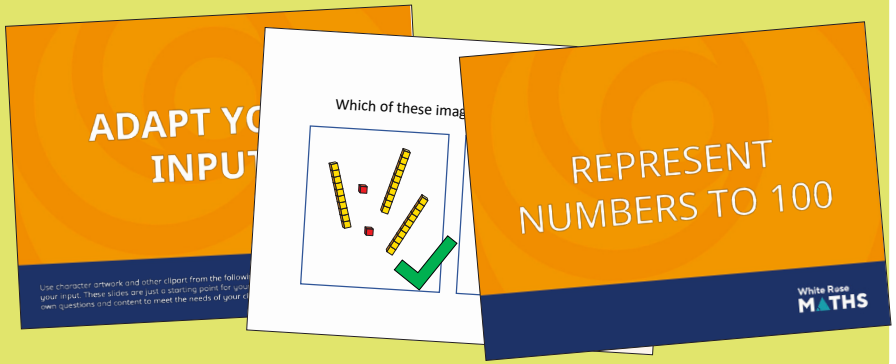
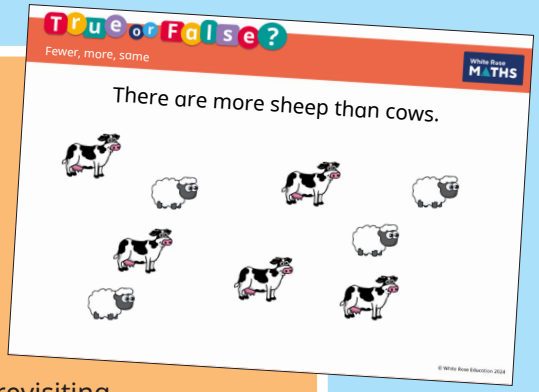
Premium supporting materials

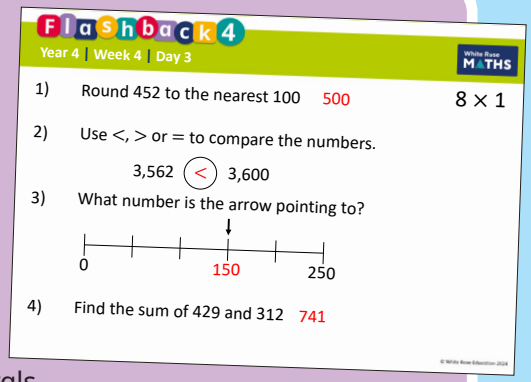
Adaptable input slides that mirror the content of our home learning videos for each step. These are fully animated and editable, so can be adapted to the needs of any class.

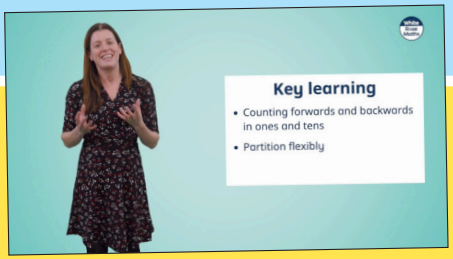


A **true or false** question for every small step in the scheme of learning. These can be used to support new learning or as another tool for revisiting knowledge at a later date.



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





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

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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.

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, subtraction, multiplication and division**					Number **Fractions A**		Number **Fractions B**		Measurement **Converting units**
Spring	**Ratio**		**Algebra**		Number **Decimals**		Number **Fractions, decimals and percentages**		Measurement **Area, perimeter and volume**		**Statistics**	
Summer	Geometry **Shape**				Geometry **Position and direction**		**Themed projects, consolidation and problem solving**					

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Autumn Block 1

Place value

Small steps

Step 1	Numbers to 1,000,000
Step 2	Numbers to 10,000,000
Step 3	Read and write numbers to 10,000,000
Step 4	Powers of 10
Step 5	Number line to 10,000,000
Step 6	Compare and order any integers
Step 7	Round any integer
Step 8	Negative numbers

Numbers to 1,000,000

Notes and guidance

In preparation for the next step (Numbers to 10,000,000), children recap their Year 5 learning by exploring numbers up to 1,000,000

Understanding that place value columns follow consistent patterns – ones, tens, hundreds, then (one) thousands, ten thousands, hundred thousands, before reaching millions – is key. Place value charts, Gattegno charts and place value counters can be used to support understanding of the relationships between columns and the construction of numbers.

Children also revise partitioning, exploring both standard and non-standard ways of composing numbers.

Writing numbers in words follows in Step 3

Things to look out for

- Children may find it difficult to conceptualise such large numbers, as they cannot easily be represented concretely and lie outside their experience.
- Children may think that place value columns go in the order ones, tens, hundreds, thousands, millions.
- Children may find numbers with several placeholders (for example, 500,020) difficult.

Key questions

- Where do the commas go when you write one million in figures?
- If 1,000,000 is the whole, what could the parts be?
- How else can you partition the number?
- What is the value of each digit in the number?
- Which columns will change if you add/subtract 10, 100, 1,000, ... to/from the number?
- When do you use placeholders in numbers?

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 up to 10,000,000 and determine the value of each digit
- Solve number and practical problems that involve the above

Numbers to 1,000,000

Key learning

- What is the value of the digit 4 in each of the numbers in the place value chart?

Thousands			Ones		
H	T	O	H	T	O
		4	3	2	7
	3	5	4	0	2
2	4	7	1	9	8
8	1	2	5	4	3

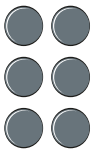
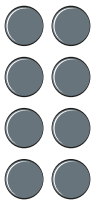
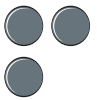
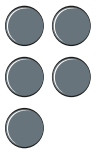
- Complete the number sentences.
  - 604,821 = 600,000 + _____ + _____ + 20 + 1
  - _____ = 300,000 + 4,000 + 700 + 4
  - 2,000 + 8 + 60,000 + 500 + 700,000 = _____

- Count up in 10,000s from 74,000 to 204,000

  Count down in 100,000s from 1,000,000 to zero.

  Count down in 100s from 9,312 to 7,812

- What number is shown in the place value chart?

Thousands			Ones		
H	T	O	H	T	O
					

  What will the number be if you add four counters to the:
  - tens column
  - ten-thousands column
  - hundreds column?

- Annie is using place value counters.

  She has 4 ten-thousands counters, 12 thousands counters, 8 hundreds counters, 3 tens counters and 25 ones counters.

  What is the greatest number she can make?

- Fill in the missing numbers.

  1 million = 900,000 + _____ = 990,000 + _____ = _____ + 999,000

Numbers to 1,000,000

Reasoning and problem solving

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

What number is shown in the Gattegno chart?

Decrease the number shown by 30,000

Increase the number shown by 100,500

Challenge a partner to find other increases and decreases of the number.

463,528 433,528 564,028

Are the statements true or false?

Adding ten thousand to a number only ever changes the digits in exactly one column.	False
The number consisting of 70 thousands and 400 ones is 700,400	False
3 ten-thousands is the same as 30 thousands.	True
400 hundreds is the same as 4 ten-thousands.	True
A large number added to a large number is always a large number.	True
A large number subtracted from a large number is always a large number.	False

Numbers to 10,000,000

Notes and guidance

Children build on the previous step to explore numbers up to 10,000,000. They need to understand that the million can be considered a unit in the same way as the thousand. Numbers do not all have to be over 1,000,000 in this step; children should continue to experience smaller numbers alongside 7-digit numbers. The placement of commas and other separators should be discussed.

Familiar manipulatives and models, such as place value charts and counters, Gattegno charts and part-whole models, are used to represent numbers. Children partition the numbers in both standard and non-standard ways.

Things to look out for

- Children may struggle with where to position the commas in large numbers.
- Children may not recognise large numbers written with no commas.
- Unless they are confident with previous learning, children may think that place value columns go in the order ones, tens, hundreds, thousands, millions.
- Children may find numbers with several placeholders (for example, 1,006,020) difficult.

Key questions

- Where do the commas go when writing 7-digit numbers? How does this connect to place value charts?
- How does the place value chart help you to represent large numbers?
- What is the value of each digit in the number?
- Are 7-digit numbers always greater than 1,000,000?
- When do you use placeholders in numbers?
- What is the same and what is different about counting in 1,000s and counting in 1,000,000s?

Possible sentence stems

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

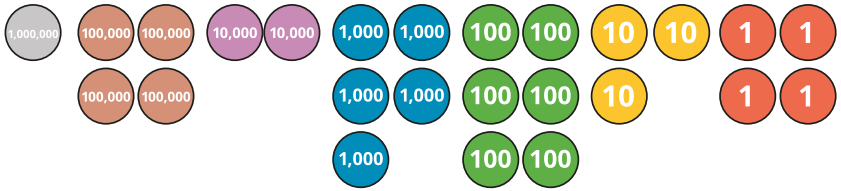
National Curriculum links

- Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
- Solve number and practical problems that involve the above

Numbers to 10,000,000

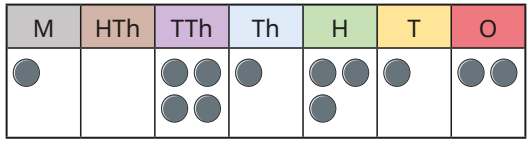
Key learning

- Count in 1,000,000s from zero to 10,000,000
- What number is represented?

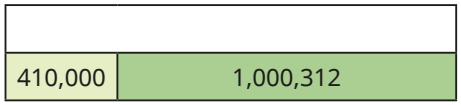


- Match the numbers to the representations.

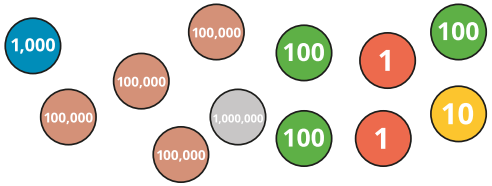
1,401,312



1,041,312



1,410,312



- The meter shows the number of kilometres a car has travelled.

Ron writes the number as 3,678,42

Explain Ron's mistake.

- Here is a number in a place value chart.

Millions	Thousands			Ones		
O	H	T	O	H	T	O
4	2	8	7	2	9	5

What number is 300,000 greater than the number shown?

What number is 20,000 greater than the number shown?

- Count up in 10,000s from 463,500 to 1,000,500

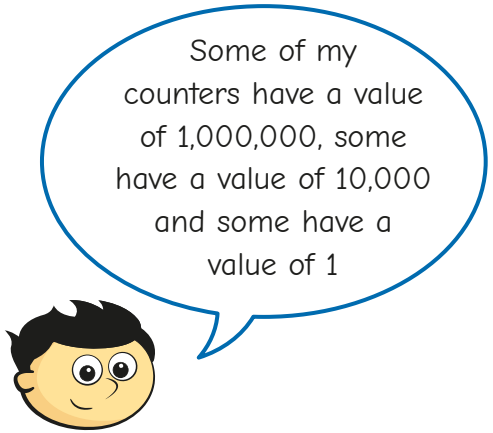
Count down in 10,000s from 463,500 to 3,500

Count down in 1,000s from 463,500 to 433,500

Numbers to 10,000,000

Reasoning and problem solving

Jack has got some place value counters.



Jack picks four counters.

What different numbers greater than 1,000,000 could he make?

Jack wants to make a number greater than 5,000,000

What is the fewest number of counters he needs?

4,000,000
3,010,000
3,000,001
2,020,000
2,010,001
2,000,002
1,020,001
1,030,000
1,010,002
1,000,003

6 counters

Fill in the missing numbers.

824,309 = 800,000 + _____ + 4,000 + 300 + 9

6,413,085 = _____ + 80

58,904 = 50,000 + _____ + 4

947,812 – 400,000 = _____

947,812 – 4,000 = _____

947,812 – 400 = _____

5,198,264 – _____ = 5,098,264

5,198,264 – _____ = 5,191,264

20,000

6,413,005

8,900

547,812

943,812

947,412

100,000

7,000

Read and write numbers to 10,000,000

Notes and guidance

Children should now be secure with the place value of numbers to 10,000,000. This small step develops their skill at reading and writing large numbers in words.

The focus of this step is learning the structure of how numbers are said and written in words, for example 4,378 as "four thousand, three hundred and seventy-eight" rather than just "four-three-seven-eight". Using a comma as a separator helps children to read and write large numbers by tackling them in sections. This can be supported visually/concretely with place value charts, part-whole models or Gattegno charts.

Children should also be able to write numbers such as "half a million" in both words and numerals.

Things to look out for

- Children who find the "teen" numbers difficult may have problems with numbers such as 5,317,418
- Children may find reading and writing numbers with placeholders (for example, 5,208,001) difficult.

Key questions

- When a number is written with two commas, what does that tell you about the size of the number?
- What do the numbers before this comma represent?
- How do you write "one million" in words and numerals?
- How do you write "half a million" in words and numerals?
- When do we use "and" when reading or writing a number?

Possible sentence stems

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

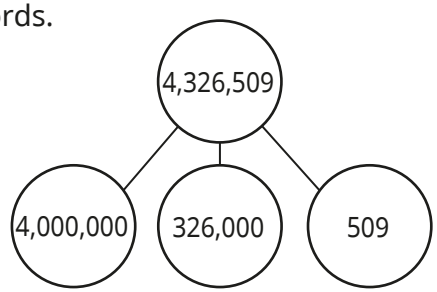
National Curriculum links

- Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
- Solve number and practical problems that involve the above

Read and write numbers to 10,000,000

Key learning

- Alex is using a part-whole model to help write the number 4,326,509 in words.

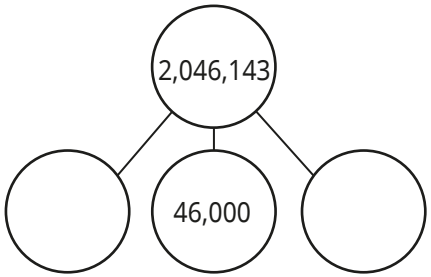


forty million and three hundred and twenty-six thousand and five hundred and nine

What mistakes has Alex made?

Write 4,326,509 correctly in words.

- Complete the part-whole model to show the number 2,046,143



Write the number 2,046,143 in words.

- Here is a number shown in a place value chart.

Millions	Thousands			Ones		
O	H	T	O	H	T	O
3	6	7	1	9	4	2

Write the number in words.

- A number is made up of 5 millions, 3 hundred-thousands, 7 tens and 9 ones.

Show the number on a place value chart.

Write the number in words and numerals.

- Write the numbers in numerals.

two million, eighty-three thousand and twelve

two million, eight hundred and three thousand and twenty

two million, eight hundred and twenty-three thousand and twelve

- Write 500,000 in words.

- Write the number "three and a half million" in numerals.

Read and write numbers to 10,000,000

Reasoning and problem solving

Use some of the digit cards and the clues to work out the number.

0	3	3	5	5	6	7

- The ten-thousands and hundreds columns have the same digit.
- The hundred-thousands digit is double the tens digit.
- The number has six digits.
- The number is less than six hundred and fifty-five thousand.

Find as many possible solutions, giving your answers in words and numerals.

Compare answers with a partner.

multiple possible answers, e.g.

650,533 – six hundred and fifty thousand, five hundred and thirty-three

Here is a number shown on a Gattegno chart.

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

Write in words the number that is:

- 80 greater than this number
- 80 less than this number
- 80,000 greater than this number
- 80,000 less than this number.

six million, thirty thousand, five hundred and eighty-four

six million, thirty thousand, four hundred and twenty-four

six million, one hundred and ten thousand, five hundred and four

five million, nine hundred and fifty thousand, five hundred and four

Powers of 10

Notes and guidance

Children should be confident with multiplying and dividing by 10, 100 and 1,000 from their learning in Year 5. In this small step, they use their place value knowledge to identify integers that are 10, 100, 1,000 times the size, or one-tenth, one-hundredth, one-thousandth the size of other integers. These relationships with decimal numbers are covered next term.

Children need to be aware that a value increases or decreases by a power of 10 between adjacent columns on a place value chart. They also need to realise that multiplying or dividing by 10 twice has the same effect as multiplying or dividing by 100 and that multiplying or dividing by 10 three times has the same effect as multiplying or dividing by 1,000

Place value charts and Gattegno charts are useful for modelling the effects of repeated multiplication and division by powers of 10

Things to look out for

- Children may think that the overall effect of, for example, × 10 followed by × 10 is × 20
- The fact that numbers increase and decrease by a factor of 10 horizontally on a place value chart, but vertically on a Gattegno chart, may be confusing for children.

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/two places to the left in a place value chart, how many times greater is the value of the digit?
- How can you use a Gattegno chart to find a number 10 times/one-tenth the size of a given number?

Possible sentence stems

- _____ is 10 times the size of _____, so _____ is one-tenth the size of _____
- _____ is 100 times the size of _____, so _____ is one-hundredth the size of _____
- Multiplying/dividing by 10 twice/three times is the same as multiplying/dividing by _____

National Curriculum links

- Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
- Solve number and practical problems that involve the above

Powers of 10

Key learning

- What number is shown in the place value chart?

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

Multiply the number by 10 and show the answer in a place value chart.

What is the same and what is different?

Multiply the number by 100 and show the answer in a place value chart.

What is the same and what is different?

- Complete the statements.

_____ cm is the same length as 5,600 m.

_____ cm is the same length as 5,600 mm.

_____ m is the same length as 56,000 cm.

_____ m is the same length as 56,000 mm.

- What number is shown on the Gattegno chart?

1,000,000	2,000,000	3,000,000	4,000,000	5,000,000	6,000,000	7,000,000	8,000,000	9,000,000
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 make the number one hundred times the size of the number shown.

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

- Huan thinks that the number a thousand times the size of 2,500 is two and a half million.

Do you agree with Huan? Explain your answer.

- Which calculations have the same answers?

460 × 10	46,000 ÷ 1,000	46 × 10 × 10
46 × 100 × 100	460 × 10 ÷ 100	4,600 ÷ 10 × 1,000

Powers of 10

Reasoning and problem solving

The Gattegno chart shows the answer to a calculation using powers of 10

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

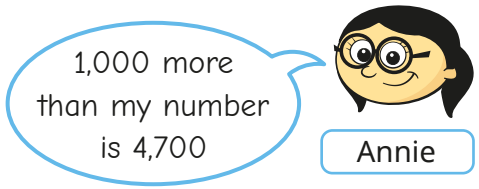
Find two integer calculations using powers of 10 that give this answer.

Give your answers as calculations, for example:
_____ × (or ÷) _____ = _____ and sentences such as "_____ is 10 times (or one-tenth) the size of _____".

Compare answers with a partner.

various possible answers, e.g.
6,830 × 10 = 68,300 68,300 is 10 times the size of 6,830
6,830,000 ÷ 100 = 68,300
68,300 is one-hundredth the size of 6,830,000

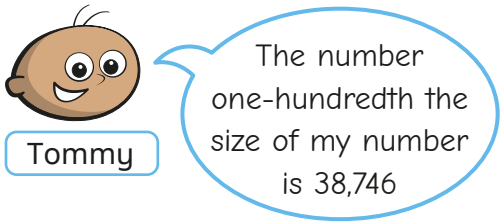
Annie is thinking of a number.



What number is 1,000 times the size of Annie's number?

3,700,000

Tommy is thinking of a number.



What number is 100 less than Tommy's number?

3,874,500

Number line to 10,000,000

Notes and guidance

Children explore the number line to 10,000,000 using the unit of a million, making links to the familiar number lines to 10 and 10,000. They label partially filled number lines, identify points labelled on number lines and mark where a given number would lie on a number line.

Children should understand that half a million is equal to 500,000 and know that the midpoints between divisions on the number line to 10,000,000 can be written as, for example, "three and a half million" or "3,500,000". This links to splitting different numbers and number lines into two, four, five and ten parts, which is also covered in this step.

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 1,000,000 and 2,000,000 is 1,000,005

Key questions

- What are the values of the start and the end of the number line?
- What is each interval worth?
- How many small divisions are there between each of the large divisions on the number line? What is each small interval worth?
- What is the same and what is different about a number line that goes from 0 to 10,000 and a number line that goes from 0 to 10,000,000?
- What is the midpoint between _____ and _____?
- What is each interval worth if one million is split into two/four/five/ten equal parts?

Possible sentence stems

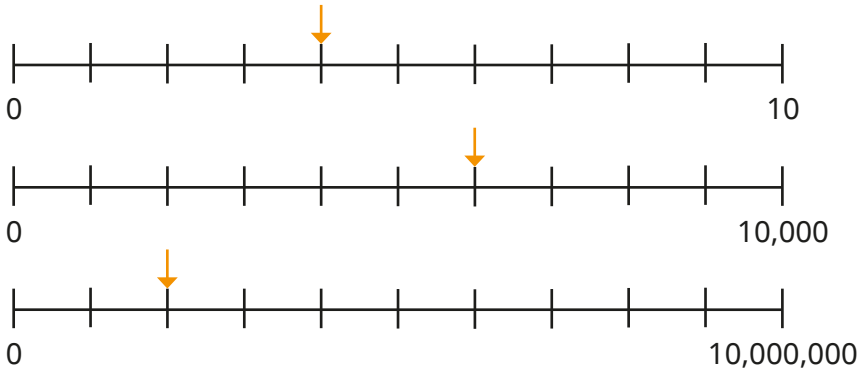
- The previous multiple of _____ is _____
- The next multiple of _____ is _____

National Curriculum links

- Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
- Solve number and practical problems that involve the above

Number line to 10,000,000

Key learning

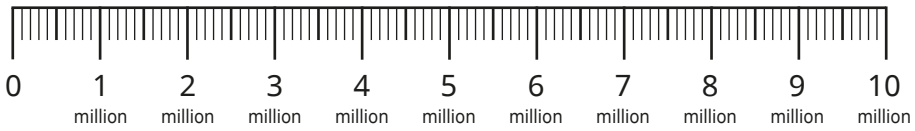
- 

  Label each division on the number lines.

  What numbers are the arrows pointing to?

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

- Here is a number line.

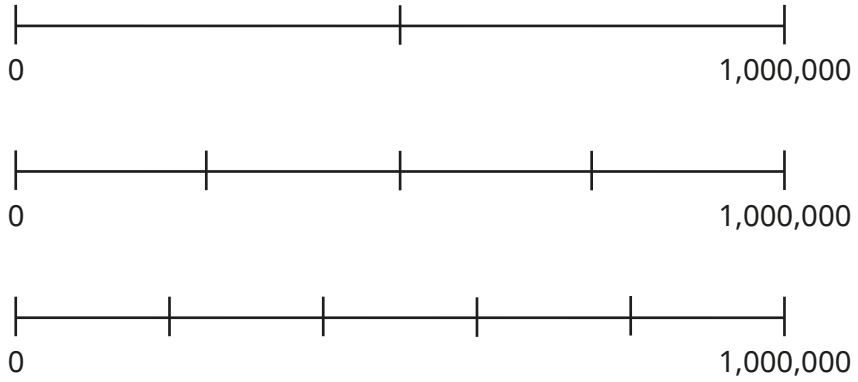


  Draw arrows to show the positions of these numbers on the number line.

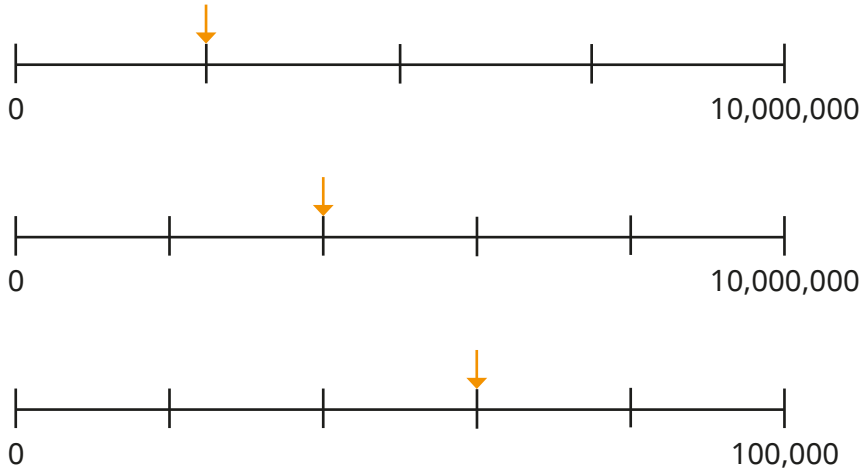
1,500,000	five and a half million	6,200,000	8,950,000

  Which numbers can you place more accurately than others?

- Label the divisions on each number line.



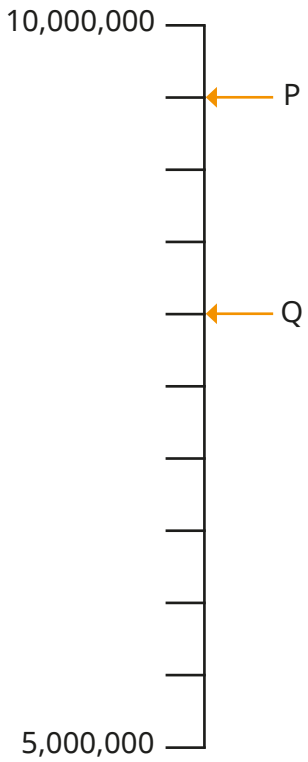
- What numbers are the arrows pointing to?



Number line to 10,000,000

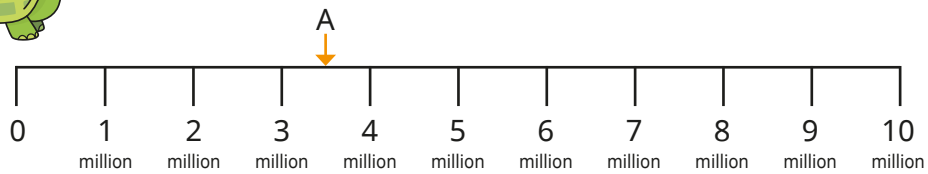
Reasoning and problem solving

Find the difference between P and Q.



Compare methods with a partner.

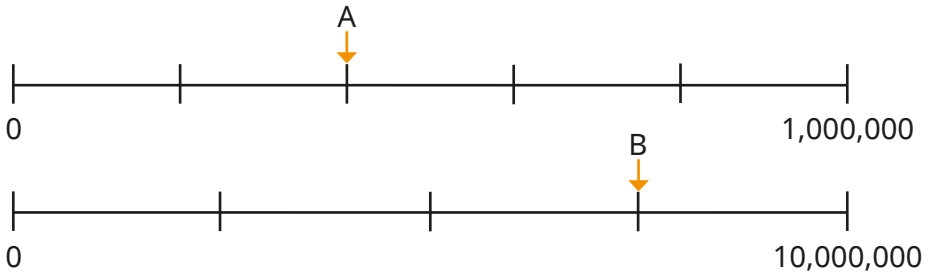
1,500,000



Tiny says A is pointing to 3,050,000

Explain the mistake that Tiny has made.

Tiny has incorrectly found the midpoint of 3 and 4 million.



Work out B – A.

7,100,000

Compare and order any integers

Notes and guidance

In Year 5, children learned how to compare and order integers up to 1,000,000. This small step extends their learning to integers up to 10,000,000

Children compare numbers with the same number of digits, and with different numbers of digits, using their knowledge of place value columns. They present numbers in a variety of forms and use these different representations to aid their understanding when comparing and ordering.

Encourage the use of inequality symbols and precise mathematical language such as “greater than” and “less than”.

Things to look out for

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

Key questions

- What is the value of each digit in the number?
- Which digit in each number has the greatest value? What is the value of these digits?
- When comparing two numbers with the same number of digits, what do you look at first?
- 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 value of the first digit in the number _____ is _____
- _____ is less than/greater than _____

National Curriculum links

- Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
- Solve number and practical problems that involve the above

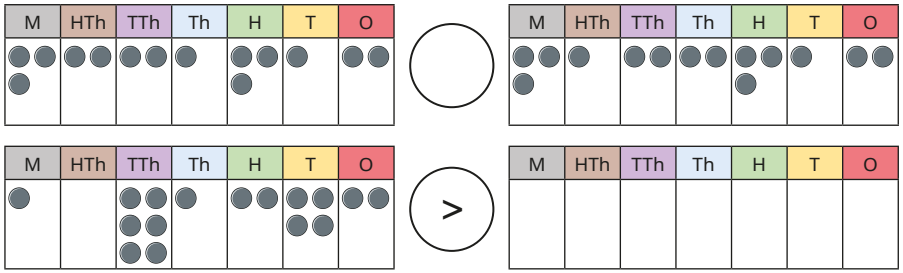
Compare and order any integers

Key learning

- Which is the greater number in each pair?
  - 62,800 60,820
  - 247,612 247,162
  - 8,642,371 8,643,271

  Explain how you know.

- Complete the statements to make them true.



- Write the numbers in ascending order.

  6,503,102 651,300 6,550,021 690,210

- Which calculation has the greater answer?

  600,000 + 50,000 + 7,000 400,000 + 256,000

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

  62,520 ◯ 602,250

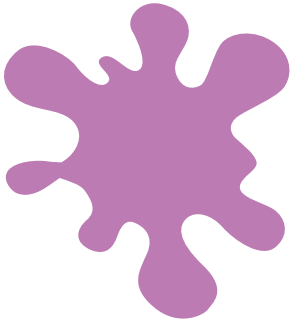
  3,218,000 ◯ 399,875

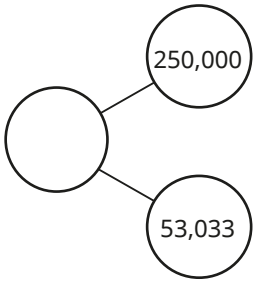
  426,000 ◯ forty-four thousand

  990,099 ◯ one million

- Here are three numbers ordered from the greatest to the smallest, but one number has been covered up.

three hundred and thirteen thousand and thirty-three





What might the covered number be?

Compare and order any integers

Reasoning and problem solving

Eva has put eight 6-digit numbers in ascending order.

- The first number in her list is 345,900
- The last number in her list is 347,000
- All the other numbers in her list have a digit sum of 20
- None of the numbers in her list have any repeated digits.

Find the other six numbers in Eva's list and write them in ascending order.

346,025

346,052

346,205

346,250

346,502

346,520

_____ + 80,000 < half a million

Complete the sentences.

The missing number could be _____

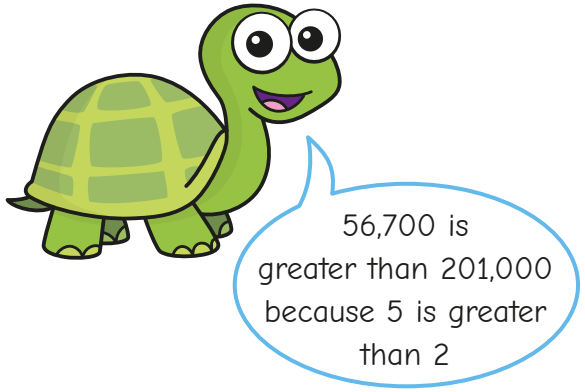
The missing number cannot be _____

The missing number must be _____

any number less than 420,000, e.g. 10,000

any number greater than or equal to 420,000, e.g. 600,000

multiple possible answers, e.g. less than 420,000



Explain the mistake that Tiny has made.

Tiny hasn't considered the place value of the digits.

Round any integer

Notes and guidance

In Year 5, children learned to round any number up to 1,000,000 to any power of 10 up to 100,000. This small step reviews and builds on this concept so that children also learn to round to the nearest million.

Children need to be confident with identifying the previous and next multiples of the appropriate power of 10 of the number, and finding the midpoints of those multiples. Number lines are useful as support here, as children can identify which multiple the number is closer to.

Children may need reminding that when a number is exactly halfway between two successive multiples the convention is to round to the greater multiple.

Things to look out for

- Children may be confused by the language "round down"/"round up" and round 428,513 to 328,513 (or 300,000) to the nearest 100,000
- Children may look at the digit of the rounding rather than the next digit, for example, looking at the thousands column rather than the hundreds when rounding to the nearest thousand.

Key questions

- Which multiples of 1,000,000 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 million?
- What is the most appropriate way of rounding this number?
- Which place value column should you look at to round the number to the nearest ten/hundred/thousand/ten thousand/ hundred thousand/million?

Possible sentence stems

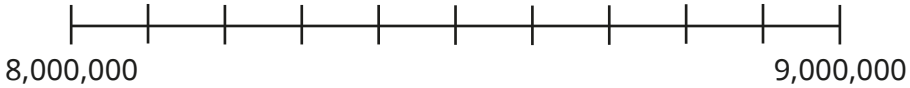
- The previous multiple of _____ is _____
- The next multiple of _____ is _____
- _____ rounded to the nearest _____ is _____

National Curriculum links

- Round any whole number to a required degree of accuracy
- Solve number and practical problems that involve the above

Round any integer

Key learning

- 

  Draw an arrow to show the approximate position of 8,640,000 on the number line.

  Round 8,640,000 to the nearest million.

- The population of London is 8,982,604

  Between which two multiples of 1,000,000 does this number lie?

  Round the population of London to the nearest million.

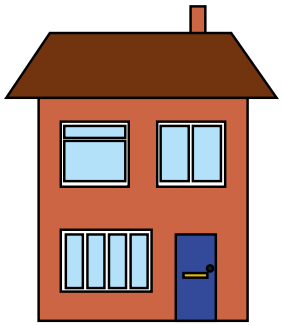
- In April 2021, the average price of a house in England was £273,486

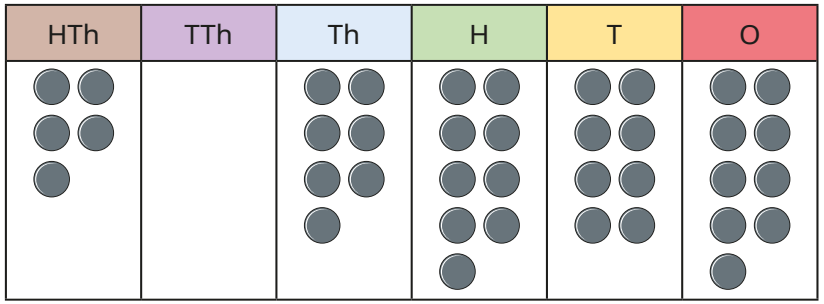
  Round this price to the nearest £100,000

  Round this price to the nearest £10,000

  Round this price to the nearest £1,000

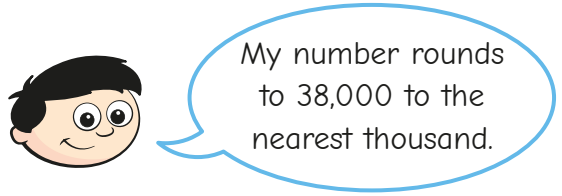
  Which do you think is the most appropriate number to round the price to?



- 

  Round the number in the place value chart to:

  - the nearest ten thousand
  - the nearest hundred thousand
  - the nearest million.

- 

  What is the greatest possible value of Dexter's number?

  What is the smallest possible value of Dexter's number?

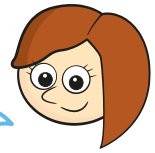
Round any integer

Reasoning and problem solving

Mo and Rosie are each thinking of a number.

My number is 1,350,000 when rounded to the nearest ten-thousand.

Mo



My number is 1,000,000 when rounded to the nearest million.

Rosie

Both numbers are whole numbers.

What is the greatest possible difference between the two numbers?

854,999

(if Mo's number is 1,354,999 and Rosie's number is 500,000)

Four children each have one of these cards.

15,987	15,813
15,101	16,101

Each child gives a clue about the number on their card.

Filip says, "My number rounds to 16,000 to the nearest thousand."

Esther says, "My number has 1 hundred."

Jack says, "My number is 15,990 when rounded to the nearest ten."

Dora says, "My number is 15,000 when rounded to the nearest thousand."

Match the cards to the children.

Filip: 15,813

Esther: 16,101

Jack: 15,987

Dora: 15,101

Negative numbers

Notes and guidance

Children encountered negative numbers in Year 5. The focus of this small step is using negative numbers in real-life contexts while reinforcing children's understanding of the number line extending beyond zero.

Both horizontal and vertical number lines should be used, with the vertical line linking to reading temperatures on a thermometer. As well as adding and subtracting from positive and negative numbers, children learn to find the difference between numbers, including calculating intervals across zero. At this stage, children do not need to subtract negative numbers, so there is no need to cover calculations of the form 7 – –5

A recap of the Year 5 steps relating to this topic may be useful.

Things to look out for

- When calculating intervals, children may count the divisions rather than the number of intervals.
- Children may have heard "rules" such as "two minuses make a plus" and mistakenly think that, for example, –3 – 2 = +5
- Because 5 is greater than 3, children may think that –5 is greater than –3

Key questions

- What is the same and what is different about the numbers 2 and –2 (negative two)?
- How far is –5 from zero? How far is –5 from 1?
- Which is the greater temperature, –1 degrees or –2 degrees?
- How do you find the difference between two negative numbers?
- How do you find the difference between a positive number and a negative number?
- What is the same and what is different about counting forwards/backwards along a number line beyond zero?

Possible sentence stems

- To find the number _____ greater/less than _____, I count _____ on the number line.
- _____ is _____ away from zero.

National Curriculum links

- Use negative numbers in context, and calculate intervals across zero
- Solve number and practical problems that involve the above

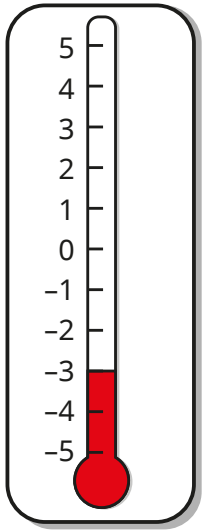
Negative numbers

Key learning

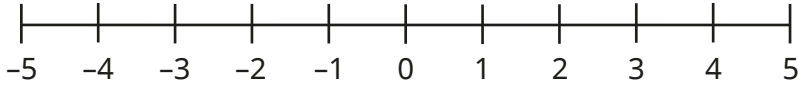
- What temperature does the thermometer show?

  If the temperature drops by 1 °C, what temperature will the thermometer show?

  What temperature is 5 °C warmer than the temperature shown on the thermometer?



- Use the number line to answer the questions.



  What is 6 less than 4?

  What is 5 more than –2?

  What is the difference between 3 and –3?

- The table shows the temperatures in four places on a day in January.

Bradford	2 °C
Harlow	–3 °C
Aberdeen	–7 °C
Southampton	4 °C

  Which place has the lowest temperature?

  Work out the difference between the temperature in Harlow and the temperature in Southampton.

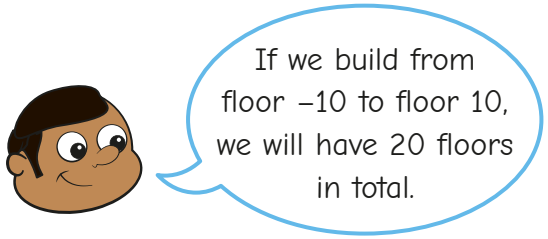
  The next day the temperature in Bradford dropped by 6 °C. Work out the new temperature in Bradford.

- Complete the number sequences.
  - 8, 5, 2, ☐, ☐
  - –11, ☐, –3, 1, ☐

Negative numbers

Reasoning and problem solving

A company has plans to construct a building with floors above and below ground.



Do you agree? Explain your answer.

No

There will be 21 floors as you need to include floor zero.

Find different ways of completing the calculation.

_____ + _____ = –2

multiple possible answers, e.g.

–6 + 4 –80 + 78

–5 + 3 –2 + 0

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

When you count forwards in tens from a positive 1-digit number, the final digits of all the numbers are the same.

When you count backwards in tens from a positive 1-digit number, the final digits of all the numbers are the same.

Give examples to support your answers.

What patterns can you see?

The first statement is always true (e.g. 8, 18, 28, 38 ...). Adding tens does not affect the ones column.

The second statement is sometimes true. It is true when we start at 5 (5, –5, –15, –25 ...), but false from every other number (e.g. 8, –2, –12, –22 ... or 7, –3, –13, –23 ...).