Autumn
Scheme of learning
Year 7

#MathsEveryoneCan

White Rose MATHS

The **White Rose Maths** schemes of learning

Why small steps?

We know that if too many concepts are covered at once, it can lead to cognitive overload, so we believe it is better to follow a small steps approach to the curriculum. As a result, each block of content in our schemes of learning is broken down into small manageable steps.

It is not the intention that each small step should last a lesson – some will be a short step withing a lesson; some will take longer than a lesson. We encourage teachers to spend the appropriate amount of time on each step for their group, and to teach some steps alongside each other if necessary.

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 students 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 students acquire depth of knowledge in each topic. Opportunities to revisit previously learnt skills are built into later blocks.

Working together

Students can progress through the schemes as a whole group, encouraging those 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 students the knowledge and skills they need to become confident mathematicians.

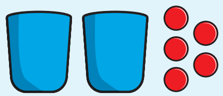
The **White Rose Maths** schemes of learning

Concrete – Pictorial – Abstract (CPA)

Research shows that all students, 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

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

x	x	5
13		

Abstract

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

$$2x + 5 = 13$$

Key Stage 3 and 4 symbols

The following symbols are used to indicate:

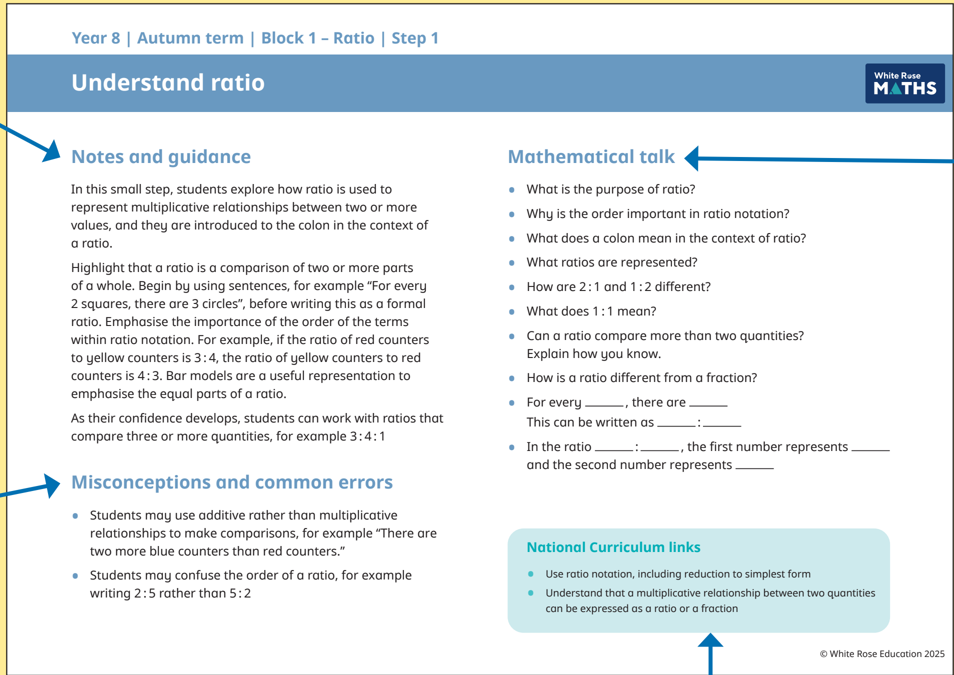
- concrete resources might be useful to help answer the question
- a bar model might be useful to help answer the question
- drawing a picture might help students to answer the question
- students talk about and compare their answers and reasoning
- a question that should really make students think. The question may be structured differently or require a different approach from others and/or tease out common misconceptions.
- the step has an explicit link to science, helping students to make cross-curricular connections.

Teacher guidance

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

Notes and guidance 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.

Misconceptions and common errors are highlighted, as well as areas that may require additional support.



Year 8 | Autumn term | Block 1 – Ratio | Step 1

Understand ratio

Notes and guidance

In this small step, students explore how ratio is used to represent multiplicative relationships between two or more values, and they are introduced to the colon in the context of a ratio.

Highlight that a ratio is a comparison of two or more parts of a whole. Begin by using sentences, for example "For every 2 squares, there are 3 circles", before writing this as a formal ratio. Emphasise the importance of the order of the terms within ratio notation. For example, if the ratio of red counters to yellow counters is 3 : 4, the ratio of yellow counters to red counters is 4 : 3. Bar models are a useful representation to emphasise the equal parts of a ratio.

As their confidence develops, students can work with ratios that compare three or more quantities, for example 3 : 4 : 1

Misconceptions and common errors

- Students may use additive rather than multiplicative relationships to make comparisons, for example "There are two more blue counters than red counters."
- Students may confuse the order of a ratio, for example writing 2 : 5 rather than 5 : 2

Mathematical talk

- What is the purpose of ratio?
- Why is the order important in ratio notation?
- What does a colon mean in the context of ratio?
- What ratios are represented?
- How are 2 : 1 and 1 : 2 different?
- What does 1 : 1 mean?
- Can a ratio compare more than two quantities? Explain how you know.
- How is a ratio different from a fraction?
- For every ______, there are ______
  This can be written as ______ : ______
- In the ratio ______ : ______, the first number represents ______ and the second number represents ______

National Curriculum links

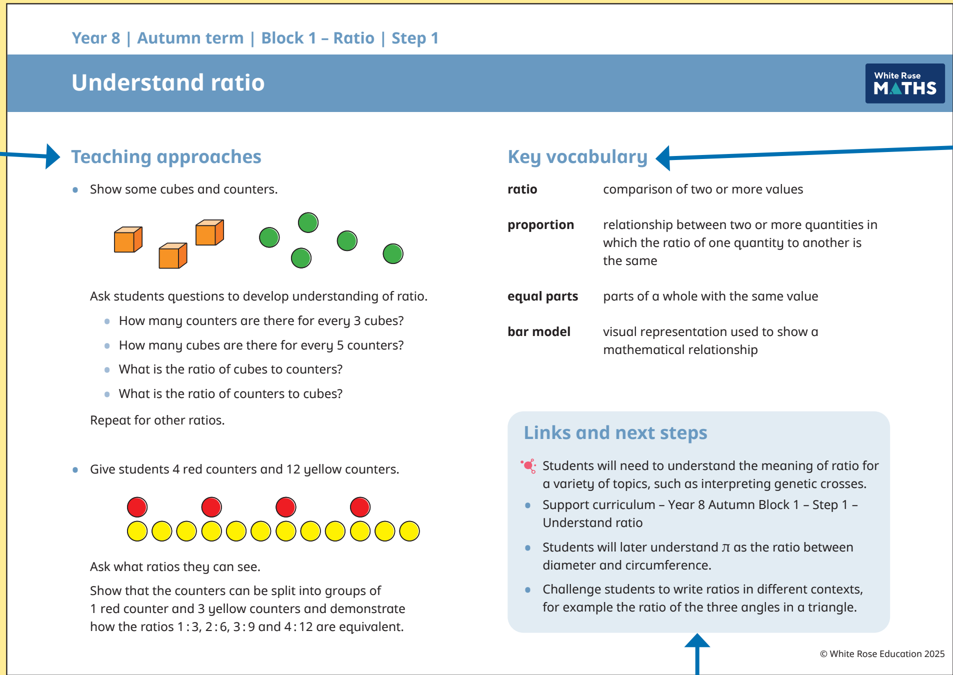
- Use ratio notation, including reduction to simplest form
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction

Mathematical talk provides key questions, discussion points and possible sentence stems that can be used to develop students' mathematical vocabulary and reasoning skills, digging deeper into the content.

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

Teacher guidance

Teaching approaches offer practical strategies for classroom use, including effective representations, modelled examples and key questions or activities designed to promote reasoning and problem solving.



Year 8 | Autumn term | Block 1 – Ratio | Step 1

Understand ratio

Teaching approaches

- Show some cubes and counters.

Ask students questions to develop understanding of ratio.

- How many counters are there for every 3 cubes?
- How many cubes are there for every 5 counters?
- What is the ratio of cubes to counters?
- What is the ratio of counters to cubes?

Repeat for other ratios.

- Give students 4 red counters and 12 yellow counters.

Ask what ratios they can see.

Show that the counters can be split into groups of 1 red counter and 3 yellow counters and demonstrate how the ratios 1 : 3, 2 : 6, 3 : 9 and 4 : 12 are equivalent.

Key vocabulary

ratio	comparison of two or more values
proportion	relationship between two or more quantities in which the ratio of one quantity to another is the same
equal parts	parts of a whole with the same value
bar model	visual representation used to show a mathematical relationship

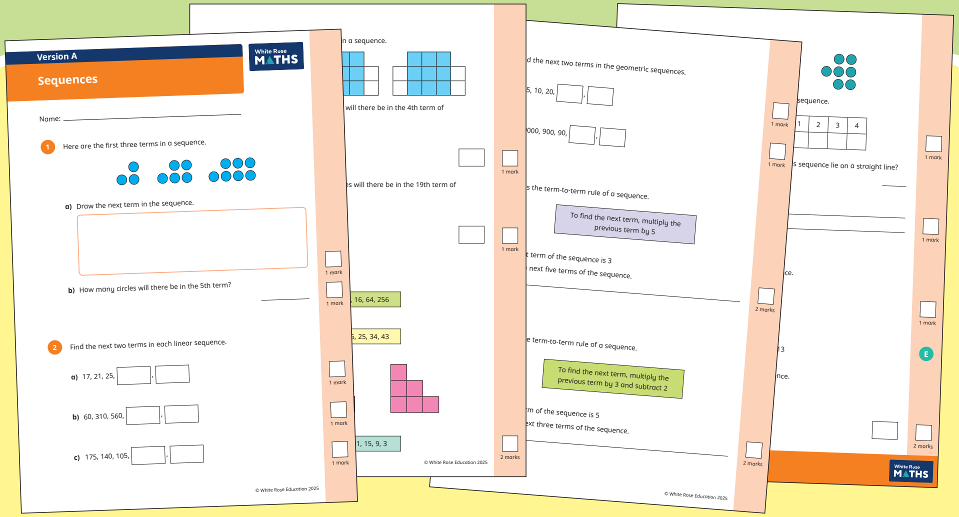
Links and next steps

- Students will need to understand the meaning of ratio for a variety of topics, such as interpreting genetic crosses.
- Support curriculum – Year 8 Autumn Block 1 – Step 1 – Understand ratio
- Students will later understand π as the ratio between diameter and circumference.
- Challenge students to write ratios in different contexts, for example the ratio of the three angles in a triangle.

Key vocabulary emphasises the importance of mathematical language and offers clear, age-appropriate definitions to support understanding

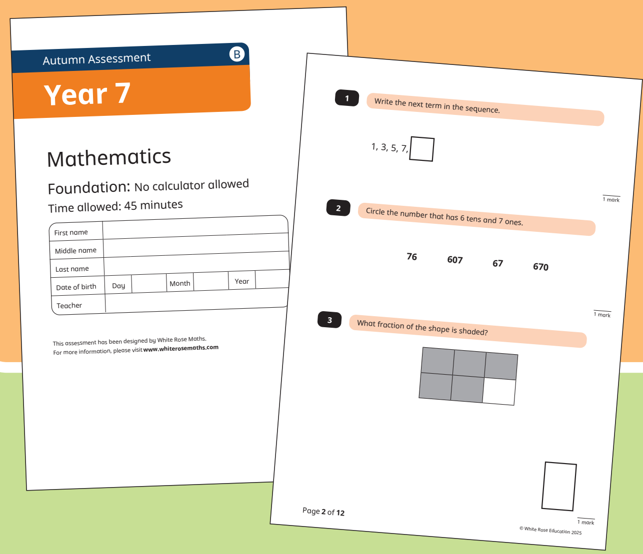
Links and next steps highlight connections to science (where appropriate) as well as alignment with the Support curriculum and shows how this step builds towards future learning. It may also include a challenge to deepen understanding, while remaining within the scope of the small step.

Free supporting materials



End-of-block assessments are provided for teachers to see how well students are progressing with the material in the curriculum. These have a total of 20 marks, assessing students' understanding of all of the steps within a block. These can be used flexibly – in the classroom, as homework, with/without a calculator, immediately after a block or later in the year – to suit teachers' and students' needs. Answers are provided.

End-of-term assessments are also provided for teachers to assess how well material is being learnt and retained in the medium and long term. There will be a calculator and non-calculator paper provided for the end of each term for each Years 7, 8 and 9. All papers will have a total of 40 marks available. We suggest 45 minutes for a paper, so that they can be done within a typical lesson. Mark schemes are provided.

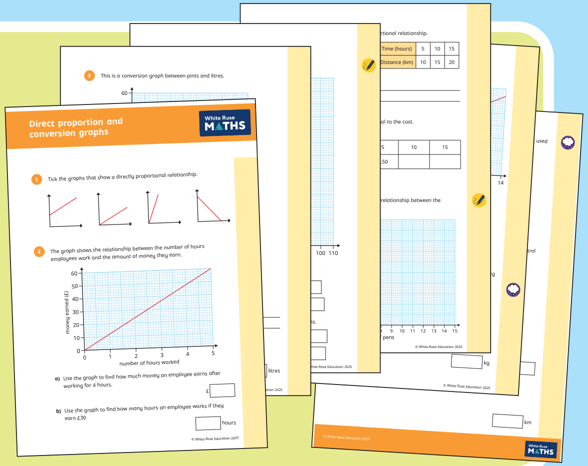


White Rose MATHS

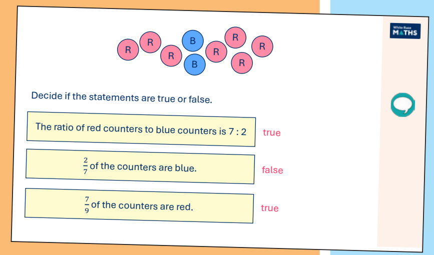
Premium supporting materials

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

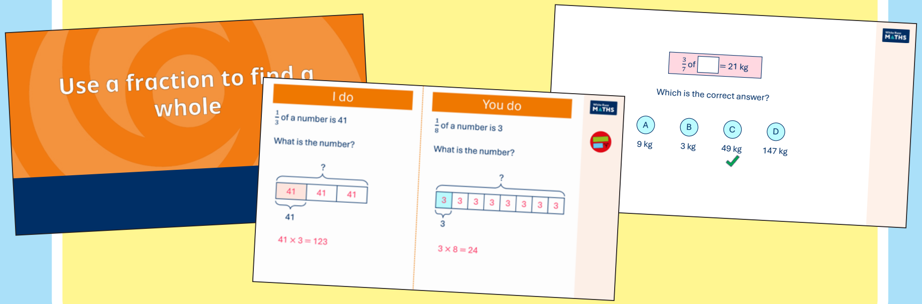
Answers to all the worksheet questions are provided.

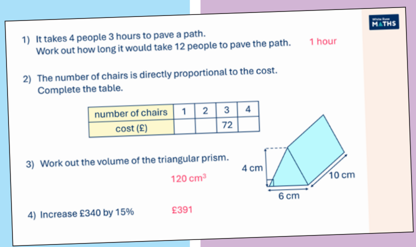


A **true or false** question for every small step in the scheme of learning. These can be used to support new learning or as another tool for revisiting knowledge at a later date.



Teaching slides for every small step, providing worked examples, multiple choice questions and open-ended questions. These are fully animated and editable, so can be adapted to the needs of any class.





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.

White Rose MATHS

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	Algebra **Sequences**		Algebra **Algebraic notation and substitution**		Algebra **Expressions and equations**		Number **Place value, ordering and rounding**		Number **Four operations**		Statistics **Averages and range**	Number **Rounding and estimation**
Spring	Statistics **Graphing data**			Number **Fractions, decimals and percentages**			Number **Directed number**		Number **Fractions and percentages of amounts**		Geometry and measures **Perimeter and area**	
Summer	Ratio, proportion and rates of change **Speed, distance and time**			Number **Properties of number**			Number **Add and subtract fractions**			Geometry and measures **Angles and polygons**		

Autumn Block 1

Sequences

Small steps

Step 1	Describe and continue sequences
Step 2	Find the next term(s)
Step 3	Linear and non-linear sequences
Step 4	Continue linear sequences
Step 5	Continue non-linear sequences
Step 6	Term-to-term rules
Step 7	Find missing terms E

E denotes an **extend step**, providing opportunities for deeper exploration of the content.

Describe and continue sequences

Notes and guidance

This small step is designed to encourage students to talk mathematically and develop their confidence in contributing to class discussion.

Students recognise and describe the change(s) from one term of a sequence to another. Ensure that they are exposed to both increasing and decreasing sequences and different types of sequences, such as linear, non-linear and oscillating. Students, however, are not expected to use these words to describe the sequences yet.

Encourage students to make the sequences using resources such as cubes or counters to help them describe and continue sequences.

Misconceptions and common errors

- Students may struggle to describe non-linear pictorial sequences when the difference between terms is not constant.
- Students may over-generalise when working with pictorial sequences, for example assuming that all sequences are linear and ascending, or that sequences cannot have negative terms.

Mathematical talk

- What is the difference between the 1st and 2nd terms?
- How could you describe how to make the next term?
- Do the terms change in the same way every time?
- To find the next term in the sequence, I need to add ______ to the previous term.
- To find the next term in the sequence, I need to remove ______ from the previous term.
- The difference between each term is ______
- Does a sequence always change from one term to the next in the same way? Explain how you know.

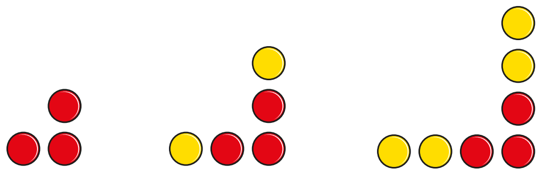
National Curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise

Describe and continue sequences

Teaching approaches

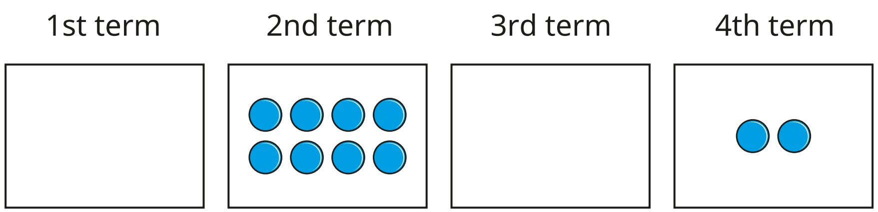
- Use different-coloured counters to create a sequence where two counters are added to the previous term.



Ask students to predict and make the 4th term of the sequence. Repeat with other terms and sequences.

- Give students some counters and ask them to make a sequence with three terms. Working in pairs, students should describe their partner's sequence and make the next term.

- Show students the 2nd and 4th terms of a sequence made from counters.



Ask students to draw the 1st and 3rd terms of the sequence. Discuss the different possible solutions.

Key vocabulary

sequence	list of items in a given order, usually following a rule
term	number/object that relates to a specific position in a sequence
position	where a number or diagram is located in a sequence
rule	description to generate terms in a sequence
previous term	term immediately before a given term
next term	term immediately after a given term

Links and next steps

- Students will describe patterns from observations, graphs or data to draw conclusions.
- Support curriculum – Year 7 Autumn Block 1 – Step 1 – Sequences of diagrams
- Students will later use algebraic expressions to describe sequences.
- Challenge students to create and describe a Fibonacci sequence.

Find the next term(s)

Notes and guidance

In this small step, students identify changes in pictorial sequences and use these to work out subsequent terms.

Students count the number of objects in each term of a pictorial sequence to generate a numerical sequence. Discuss the differences between terms, asking students to predict how many objects there will be in subsequent terms. Introduce them to sequences with more than one type of object in each term, for example 1 square and 4 circles, followed by 2 squares and 6 circles, and so on, where the number of squares represents the position of each term in the sequence. Ensure that students are exposed to both linear and non-linear sequences.

Misconceptions and common errors

- When presented with sequences involving more than one type of object, students may always focus on the total number of objects in a term rather than on the types of objects.
- Students may use multiplicative reasoning to incorrectly predict terms. For example, if the 3rd term of a sequence has 7 circles, they may say that the 6th term will have 14 circles because 3 × 2 = 6 and 7 × 2 = 14

Mathematical talk

- How many objects are there in the ______ term?
  How do you know?
- Is there an efficient way to count the number of objects in each term?
  Does this help you to predict the number of objects in the 10th/100th term?
- How do the terms in the sequence change from one term to the next?
- What patterns can you see in the sequence?
- How could you check your prediction?
- The difference between each term is ______
- The ______ term will have ______ squares/circles/lines.

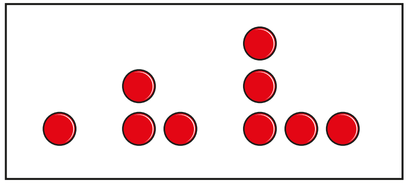
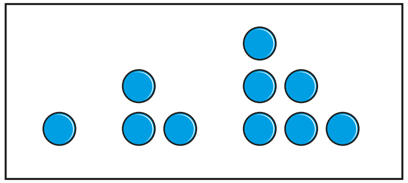
National Curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise

Find the next term(s)

Teaching approaches

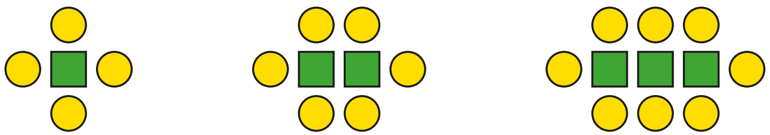
- Show a linear and a non-linear pictorial sequence and ask what is the same and what is different.

Ask students how they could work out how many circles there are in the next term and the 6th term of each sequence.

Encourage students to check their answers by drawing.

- Show a sequence made up of squares and circles.



1 square	2 squares	3 squares
4 circles	6 circles	8 circles
5 objects	8 objects	11 objects

Ask students to make predictions about other terms in the sequence. Model recording the number of squares, circles and objects in each diagram.

Key vocabulary

sequence	list of items in a given order, usually following a rule
term	number/object that relates to a specific position in a sequence
position	where a number or diagram is located in a sequence
rule	description to generate terms in a sequence
term-to-term rule	rule that describes how to get from one term of a sequence to the next

Links and next steps

- Students will be introduced to the electronic structure of elements, which follows a pictorial sequence.
- Support curriculum – Year 7 Autumn Block 1 – Step 2 – Continue number sequences
- Students will later use algebraic expressions to describe sequences and generate terms.
- Challenge students to decide if a term will occur in a sequence. For example, will there be a term in the sequence that contains 15 squares?

Linear and non-linear sequences

Notes and guidance

In this small step, students recognise the difference between linear (also known as arithmetic) and non-linear sequences and use these words to describe them.

Students learn that a linear sequence has a constant difference between terms and a non-linear sequence does not. Examples of non-linear sequences include geometric, quadratic and Fibonacci sequences. Although representing sequences graphically is not essential at this stage, appropriate technology/software could be used to highlight patterns and develop a deeper understanding of the terms “linear” and “non-linear”.

Misconceptions and common errors

- Students may assume that all sequences are linear if they only look for the difference between two given terms, rather than comparing other differences in the same sequence.
- Students may assume that all non-linear sequences are geometric sequences, and therefore decide that the terms of any non-linear sequence can be generated by multiplying the previous term by a specific value.

Mathematical talk

- How is a linear sequence different from a non-linear sequence?
- How can you decide if a sequence is linear/non-linear?
- Can a linear/non-linear sequence decrease?
- The sequence has a common difference of ______
- The difference between the terms is constant, so the sequence is ______
- The difference between the terms is not constant, so the sequence is ______
- In a non-linear sequence, do the differences always increase between the terms of the sequence? Explain how you know.

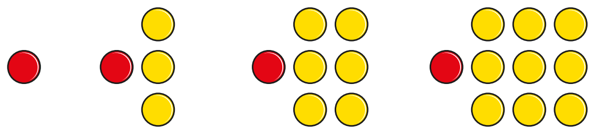
National Curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise

Linear and non-linear sequences

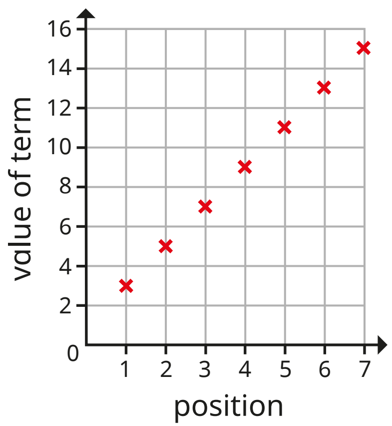
Teaching approaches

- Use different-coloured counters to create a sequence.



Ask students to decide if the sequence is linear or non-linear and explain how they know. Give more examples, drawing attention to the number of counters added/subtracted each time.

- Show the graph of a sequence.



Ask students questions about the graph.

- Is the sequence linear or non-linear? How do you know?
- What is the 1st/2nd/3rd term of the sequence?
- Why should the points not be joined up?

Key vocabulary

common difference	constant value that is added to or subtracted from each term to get the next term of a sequence
linear sequence	sequence with a common difference between consecutive terms
non-linear sequence	sequence with no common difference between consecutive terms
ascending sequence	sequence where each term is greater than the previous term
descending sequence	sequence where each term is smaller than the previous term

Links and next steps

- Students will describe patterns from observations, graphs or data to draw conclusions.
- Support curriculum – Year 7 Autumn Block 1 – Step 5 – Linear and non-linear sequences
- Students will later generate terms and algebraic expressions for linear and non-linear sequences.
- Challenge students to create a linear/non-linear sequence where the 3rd term is 10

Continue linear sequences

Notes and guidance

In this small step, students develop their understanding from earlier in the block to continue sequences. The focus is solely on linear sequences, both ascending and descending, including decimals where appropriate.

Model how to find the common difference between terms and apply this to work out subsequent terms in a given sequence. Students could also generate linear sequences from given information, for example the first term and the common difference. Calculators can be provided to offer further support and to help students develop their calculator skills.

Misconceptions and common errors

- Students may interpret the difference between terms as meaning they always "add" a value to the previous term to find the next, ignoring whether the sequence is ascending or descending.
- Students may neglect to consider inverse operations if given a term other than the 1st term and a common difference.

Mathematical talk

- How can you work out the common difference of a linear sequence?
- How does the common difference help you to work out missing terms in a linear sequence?
- How many terms do you need, to work out the common difference?
- Can a linear sequence have negative terms?
- If you know the 2nd and 3rd terms of a linear sequence, how can you work out the 1st term?
- The common difference is ______, so the next term is ______
- If you know the 1st term and the common difference of a sequence, explain why it is possible for the sequence to be completed in two different ways.

National Curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences

Continue linear sequences

Teaching approaches

- Show the first four terms of a sequence.

  17, 43, 69, 95 ...

  Ask questions about the sequence.
  - How can you work out the common difference?
  - What is the next term?
  - What is the 10th term?
  - What is the next term of the sequence 95, 69, 43, 17?

- Show information about two sequences.

A	B
The 1st term is 5 The common difference is 2	The 1st term is 5 The common difference is 4

  Ask students to write the first ten terms of each sequence.

  Lead a class discussion on the similarities and differences between the two sequences.

  Ask other questions.
  - Is there more than one sequence that could be written for each set of information?
  - How would the sequence change if the common difference was 8?

Key vocabulary

common difference constant value that is added to or subtracted from each term to get the next term of a sequence

linear sequence sequence with a common difference between consecutive terms

ascending sequence sequence where each term is greater than the previous term

descending sequence sequence where each term is smaller than the previous term

Links and next steps

- Students will describe patterns from observations, graphs or data to draw conclusions.
- Support curriculum – Year 7 Autumn Block 1 – Step 2 – Continue number sequences
- Students will later generate the terms of a linear sequence given as an algebraic expression.
- Challenge students to work out the missing terms of a fractional sequence, for example $\frac{1}{2}$, $\frac{3}{5}$, $\frac{9}{10}$, 1...

Continue non-linear sequences

Notes and guidance

In this small step, students explore non-linear sequences.

As with previous steps, encourage students to identify differences between terms to decide if the sequence is linear or non-linear.

Introduce geometric sequences by providing some terms and a rule, for example **double the previous term**. Model strategies to work out the multiplier in a geometric sequence, such as dividing the 2nd term by the 1st term. Ensure that both increasing and decreasing sequences are used throughout.

Students should also be given strategies to generate terms for other non-linear sequences, such as quadratic sequences. The use of calculators is recommended for this step to reduce cognitive load.

Misconceptions and common errors

- Students may apply methods for continuing linear sequences to non-linear sequences.
- Students may assume that all non-linear sequences are geometric and therefore have a multiplier, which is not the case for non-linear sequences such as quadratic and Fibonacci sequences.

Mathematical talk

- Do geometric sequences always increase?
- Do geometric sequences always increase/decrease faster than linear sequences?
- Is it possible for a geometric sequence to have both positive and negative terms?
- How many terms do you need to know to generate a Fibonacci sequence?
- To find the next term in the sequence, I need to multiply the previous term by ______
- To find the next term in the sequence, I need to divide the previous term by ______
- Does the difference between terms in a non-linear sequence always increase as the sequence continues? Explain how you know.

National Curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise geometric sequences and appreciate other sequences that arise
- Recognise arithmetic sequences

Continue non-linear sequences

Teaching approaches

- Show information about two sequences.

A	B
A sequence is found by adding 3 to the previous term The 1st term is 2	A sequence is found by multiplying the previous term by 3 The 1st term is 2

Ask students to write the first five terms of each sequence.

Then ask questions about the sequences.

  - What is the same/different about the sequences?
  - Which sequence has a common difference?
  - Which sequence is non-linear?
  - Which sequence will reach 1000 first?

- Give the first four terms of a non-linear sequence that is not geometric.

2, 6, 11, 17 …

Ask students questions about the sequence.

  - Is the sequence linear or non-linear? How do you know?
  - Is the sequence geometric? How do you know?
  - What is the next term?
  - What is the 10th term?

Key vocabulary

common difference constant value that is added to or subtracted from each term to get the next term of a sequence

second difference difference between the first differences of a sequence

linear sequence sequence with a common difference between consecutive terms

non-linear sequence sequence with no common difference between consecutive terms

geometric sequence sequence where each successive term is found by multiplying or dividing the previous term by the same number

Links and next steps

- Support curriculum – Year 7 Autumn Block 1 – Step 5 – Linear and non-linear sequences
- Students will later generate the terms of a non-linear sequence given as an iterative formula.
- Challenge students to work out the missing terms of a negative geometric sequence.

Term-to-term rules

Notes and guidance

In this small step, students find and use term-to-term rules. This step could be taught alongside the previous two steps.

Encourage students to use full sentences and mathematical vocabulary to describe the term-to-term rule for any given sequence. Remind them that linear sequences have a constant difference and ensure that they describe rules with enough detail to avoid ambiguity, for example **add 7 to the previous term**. Model strategies to work out term-to-term rules for both linear and non-linear sequences, including Fibonacci sequences. The use of calculators is encouraged to reduce cognitive load.

Misconceptions and common errors

- Students may describe a term-to-term rule with insufficient detail, for example **add 3** rather than **add 3 to the previous term**.
- Some students may identify a non-linear sequence as linear by investigating the difference between two terms only.
- Some students may think that any sequence that can be described by a rule to get from one term to the next is a linear sequence, for example 3, 6, 12, 24 …

Mathematical talk

- How many terms do you need, to work out a term-to-term rule?
- Is it possible to write a term-to-term rule for a sequence if the first term is unknown?
- What is the difference between an arithmetic and a geometric sequence?
- What is the same and what is different about the sequences 5, 8, 11, 14, 17 … and 1, 4, 7, 10, 13 … ?
- Create a linear sequence where the rule to get from one term to the next is **add 5 to the previous term**.
- How would you get from the 1st to the ______ term in this sequence?
- The common difference is ______, so the term-to-term rule is add/subtract ______ to/from the previous term.

National Curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise

Term-to-term rules

Teaching approaches

- Show the first five terms of some sequences.

A	20, 18, 16, 14, 12 …
B	20, 22, 24, 26, 28 …
C	20, 40, 80, 160, 320 …

  Ask students to discuss what is the same and what is different about the sequences, prompting with questions.

  - Which sequences are linear/non-linear?
  - Are the term-to-term rules for sequences A and B the same?
  - Is **add 2** a term-to-term rule?

  Ask students to write the term-to-term rule for each sequence, highlighting the detail needed, for example **add 2 to the previous term**.

- Give students the first two numbers of a sequence and ask them to write a term-to-term rule. Compare the sequences generated by the students' rules and ask them to decide if the sequences are linear or non-linear.

Key vocabulary

previous term	term immediately before a given term
term-to-term rule	rule that describes how to get from one term of a sequence to the next
arithmetic sequence	linear sequence
geometric sequence	sequence where each successive term is found by multiplying or dividing the previous term by the same number
Fibonacci sequence	sequence where the next term is found by adding the previous two terms together

Links and next steps

- Support curriculum – Year 7 Autumn Block 1 – Step 3 – Term-to-term rules
- Students will apply their understanding of term-to-term rules to generate algebraic expressions to describe sequences.
- Challenge students to write a term-to-term rule for a sequence involving algebraic terms, for example $2x + y$, $3x + 3y$, $4x + 5y$, $5x + 7y$ …

E Find missing terms

Notes and guidance

In this small step, students use a range of strategies to find missing terms in sequences where the rule cannot be determined from adjacent terms.

Start with finding terms that are further away than the next term in a sequence. For example, finding the 6th term given the first three terms of a sequence.

Provide examples where students are given the 1st term and another term (not the 2nd term) of a linear sequence, encouraging them to think about the number of common differences between the terms. As confidence develops, students can explore missing terms in both linear and non-linear sequences.

Misconceptions and common errors

- Students may misinterpret differences between non-consecutive terms in a sequence. For example, in the sequence 3, ______, 11 … , students may think that the missing term is 8 because 11 − 3 = 8
- Some students may try to use incorrect mathematical methods to find missing terms, for example multiplying the 3rd term of a linear sequence by 2 to find the 6th term.

Mathematical talk

- How many terms are there between the 1st and 3rd terms?
- How many differences are there between the 1st and 3rd terms?
- How can you work out the 4th/5th/10th term?
- Is the sequence linear or non-linear?
- The term-to-term rule is ______
- How do your answers change, if the sequence is arithmetic?
- How do your answers change, if the sequence is geometric?
- Is it possible to have an arithmetic and geometric sequence with the same first three terms?

National Curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise

E Find missing terms

Teaching approaches

- Show the first two numbers of a linear sequence.

  5, 11 …

  Ask students questions about the sequence.
  - What is the term-to-term rule?
  - What is the 3rd term?
  - What would you add to the 2nd term to find the 4th term?
  - How could you work out the ______ term?

- Display linear sequences that involve procedural variation, to draw students' attention to the position of the given terms.

  Ask students to work out the missing terms.

  2, 14, ______

  2, ______, 14

  2, ______, ______, 14

  2, ______, ______, ______, 14

  ______, 2, ______, ______, 14

  ______, ______, 2, ______, 14

Key vocabulary

geometric sequence	sequence where each successive term is found by multiplying or dividing the previous term by the same number
previous term	term immediately before a given term
linear sequence	sequence with a common difference between consecutive terms
non-linear sequence	sequence with no common difference between consecutive terms
arithmetic sequence	linear sequence
term-to-term rule	rule that describes how to get from one term of a sequence to the next
position	where a number or diagram is located in a sequence

Links and next steps

- Students will apply their understanding of term-to-term rules to generate algebraic expressions to describe sequences.
- Challenge students to find strategies to work out missing terms in a Fibonacci sequence.