

# Numicon 4/NZ Year 5 Planning

The summaries and links in this document will help you to get the most out of your subscription to *Numicon Online*.

You can follow *Numicon* as a complete teaching programme using the long-term plan provided here.

You can also dip into the rich bank of activities and resources to supplement your teaching. Pick a topic on the long-term plan, click on it for details and to open it in the online handbook.

## Contents

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### Long-term plan

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This long-term plan shows you the recommended order for teaching the Numicon 4/NZ Year 5 Activity Groups over the school year. It includes links to the summary information for each unit and links to open those activities in the online handbooks. Milestone markers on the plan take you to the skills and understanding children need to be secure in to help them progress.

| Strand and Activity Group Number | Activity Group Title   |
|----------------------------------|--|
| Getting Started                  | Getting started with Number, Pattern and Calculating 4                     |
| Calculating 1                    | Using adding and subtracting facts and understanding inverse relationships |
| Numbers and the Number System 1  | Understanding place value in 4-digit numbers                               |
| Pattern and Algebra 1            | Exploring sequences and number patterns                                    |
| Numbers and the Number System 2  | Ordering and comparing numbers to 1000 and beyond                          |
| Calculating 2                    | Strategies for bridging when adding and subtracting                        |

**NPC Milestone 1**

### Details for each unit of learning

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These are summaries for each unit. They follow the order in the long-term plan and list every activity in the unit. Log into your subscription to Numicon Online first, then click on any activity to open it in the online handbook. When you're in the online handbook you can go to the Links tab and download the accompanying resources, including any Explorer Progress worksheets, photocopy masters or Explore More homework.

**Getting Started: Getting started with Number, Pattern and Calculating 4**

**Key mathematical ideas** Pattern, Adding, Subtracting, Multiplying, Dividing, Place value, Mathematical thinking and reasoning

**Educational context**  
This activity group is to help children and teachers become familiar with structured apparatus including Numicon Shapes, number rods and base-ten apparatus, and to help them make connections between the patterns and structure they see and their number ideas. Actions for the four calculating symbols are also introduced in this activity group. The activities provide essential opportunities for children to connect meanings with structured apparatus for themselves, and will give teachers valuable insights into children's mathematical understanding. This will help with initial assessing, which in turn may affect how teachers decide to group children. If children are not accustomed to writing on open-ended activities some of their initial responses may be superficial, consequently they will need encouragement to persevere and they develop confidence to find things out for themselves. Depending on children's previous experiences, allow two or three days for these activities before moving on to Calculating 1, Numbers and the Number System 1 and Pattern and Algebra 1.

**Learning opportunities**

- To connect Numicon Shapes with number ideas
- To connect number rods with number ideas
- To connect structured apparatus with numerals, number words and positions on a number line
- To see and explain patterns in number relationships illustrated with structured apparatus
- To describe number relationships using mathematical language
- To revise the mathematical language for calculating operations
- To revise actions representing the symbols of arithmetic notation: "+", "-", "x", "÷"
- To revise use of 'is less/fewer than' and 'is greater/more than' symbols (< and >) respectively
- To revise using the column methods of adding and subtracting and the short written methods of multiplying and dividing

**Terms for children to use**  
number names to 100 and beyond, pattern, next, before, after, in between, ordinal number names (e.g. first, second, third), terms for comparing (e.g. small, smaller than, smallest, long, longer than, longest, few, fewer than, fewest, more than, less than, greater than), set, add, subtract, total, more, take away, subtract, difference, decrease, how many more to reach, ×, multiply, times, divide, share between, equal, visualize, column method, short written method

**Assessment opportunities**  
Look and listen for children who can:  
• Use the terms for children to use effectively  
• Notice and describe the attributes of Numicon Shapes and number rods and use these to sort both Shapes and rods in different ways  
• Refer to Numicon Shapes and number rods by number name, order them and describe relationships between them  
• Connect Numicon Shapes, number rods, numerals and number names with positions on a number line  
• Recognize and use the language for adding, subtracting, multiplying and dividing and the symbols "+", "-", "x", "÷" and ">"  
• Use structured apparatus to illustrate their thinking  
• Describe relationships they see in structured apparatus using mathematical language  
• Use the column methods of adding and subtracting and the short written methods of multiplying and dividing effectively if children have ongoing difficulties they are likely to need additional and differentiated support. Refer back to the Number Pattern and Calculating 2 and 3 Teaching Resource handbooks for activities to establish children's understanding of earlier ideas. If any children are experiencing more fundamental difficulties, consider running the Numicon Intervention Programme for them.

**Explorer Progress Book 4A, pp. 2–3**  
After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

**Explore More Copymaster 1: Numicon Shape Pattern Hunt**  
After completing work on Activity 4, give children Explore More Copymaster 1: Numicon Shape Pattern Hunt (enlarged to A3) to take home.

**Focus activities**

- What maths can you show with Numicon Shapes?
- What maths can you show with number rods?
- Know the Numicon Shape patterns
- Describe relationships between Numicon Shapes or number rods
- Cover the board with Numicon Shapes
- Supporting calculation with Numicon Shapes or number rods
- What maths can you show with base-ten apparatus

### Assessment support

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Milestone statements help you assess progress throughout the year and inform your teaching and planning. They indicate the skills and understanding children need to be secure in as they progress through the teaching programme before they are able to successfully meet new ideas. This section includes a link to the set of question cards that can be used for assessment or self-assessment and to a tracking spreadsheet to help you record that information.

| Milestone  | Code    | NPC / GM | Numicon strand | AG   | NC strand                 |
|--|---------|----------|----------------|------|---------------------------|
| <b>Number, Pattern &amp; Calculating 4 Milestone 1</b>   |         |          |                |      |                           |
| By this point, children should be able to:   |         |          |                |      |                           |
| • To give a sensible estimate of amounts of more than 100 objects  | NPC4:1a | NPC      | NNS            | NNS1 | Number & place value      |
| • To count aloud across multiples of 100 and multiples of 1000 to 10 000   | NPC4:1b | NPC      | NNS            | NNS2 | Number & place value      |
| • To read, write and build 4-digit numbers with apparatus and say the value of each digit                              | NPC4:1c | NPC      | NNS            | NNS1 | Number & place value      |
| • To order and compare numbers to 1000   | NPC4:1d | NPC      | NNS            | NNS2 | Number & place value      |
| • To recognize and count forwards and backwards in sequences of multiples of all numbers to 12                         | NPC4:1e | NPC      | P&A            | P&A1 | Multiplication & division |
| • To notice patterns in sequences of multiples, explain the rule for the sequence and use this to find missing numbers | NPC4:1f | NPC      | P&A            | P&A1 | Number & place value      |
| • To use the idea of constant difference to find missing numbers in sequences  | NPC4:1g | NPC      | P&A            | P&A1 | Number & place value      |
| • To know and use patterns in adding and subtracting facts for any multiple of 10                                      | NPC4:1h | NPC      | C              | C1   | Addition & subtraction    |
| • To have fluent recall of adding and subtracting facts to 10 to derive adding and subtracting facts to 100            | NPC4:1i | NPC      | C              | C1   | Addition & subtraction    |
| • To recall adding and subtracting facts to add and subtract single digit numbers to/from any number to 1000           | NPC4:1j | NPC      | C              | C2   | Addition & subtraction    |
| • To use the inverse relationship between adding and subtracting to check totals are correct                           | NPC4:1k | NPC      | C              | C1   | Addition & subtraction    |
| <b>Number, Pattern &amp; Calculating 4 Milestone 2</b>   |         |          |                |      |                           |
| By this point, children should be able to:   |         |          |                |      |                           |

## Long-term plan for Numicon 4 (NZ Year 5)

There are two Numicon teaching handbooks for each year group. Subscribers to *Numicon Online* have access to a digital version of these. Print versions are also available (visit: [www.edushop.nz](http://www.edushop.nz)). The units in these books are called Activity Groups. They contain a collection of activities you can use with your class.

This long-term plan shows you the recommended order for teaching the Activity Groups over the school year.

- Click on a heading in the **left** column to get all the information for that Activity Group.
- Click on an Activity Group title in the **right** column to go straight to those activities in the online handbooks.

### Milestones







To help you monitor learning, the skills and understanding children need to be secure with as they progress through the programme have been captured in a series of milestone statements. Click on the milestone icons to see these. Extra support to help you use these is provided at the end of this document.

## Number, Pattern and Calculating 4

## Geometry, Measures and Statistics 4

## Statistics and Probability Booklet (*coming soon*)

| Strand and Activity Group Number       | Activity Group Title  |
|--|---|
| <b>Getting Started</b>                 | <u>Getting started with Number, Pattern and Calculating 4</u>                     |
| <b>Calculating</b> 1                   | <u>Using adding and subtracting facts and understanding inverse relationships</u> |
| <b>Numbers and the Number System</b> 1 | <u>Understanding place value in 4-digit numbers</u>                               |
| <b>Pattern and Algebra</b> 1           | <u>Exploring sequences and number patterns</u>                                    |
| <b>Numbers and the Number System</b> 2 | <u>Ordering and comparing numbers to 1000 and beyond</u>                          |
| <b>Calculating</b> 2                   | <u>Strategies for bridging when adding and subtracting</u>                        |
| <b>NPC Milestone 1</b>                 |   |
| <b>Numbers and the Number System</b> 3 | <u>Estimating and rounding</u>  |
| <b>Geometry</b> 1                      | <u>Classifying triangles and quadrilaterals</u>                                   |
| <b>Calculating</b> 3                   | <u>Developing fluency with mental adding strategies</u>                           |
| <b>Calculating</b> 4                   | <u>Developing fluency with mental subtracting strategies</u>                      |
| <b>Calculating</b> 5                   | <u>Developing fluency with multiplying facts to <math>12 \times 12</math></u>     |
| <b>Calculating</b> 6                   | <u>Developing fluency with dividing facts to <math>12 \times 12</math></u>        |
| <b>NPC Milestone 2</b>                 |   |
| <b>Pattern and Algebra</b> 2           | <u>Exploring inverse relationships</u>  |
| <b>Calculating</b> 7                   | <u>Mental strategies for multiplying and dividing by 10 and 100</u>               |
| <b>Geometry</b> 2                      | <u>Understanding reflective symmetry</u>  |
| <b>Numbers and the Number System</b> 4 | <u>Introducing negative numbers</u>   |
| <b>Numbers and the Number System</b> 5 | <u>Fractions and recognizing part-whole relationships</u>                         |
| <b>Calculating</b> 8                   | <u>Developing fluency with the column method of adding</u>                        |
| <b>Calculating</b> 9                   | <u>Developing fluency with the column method of subtracting</u>                   |
| <b>NPC Milestone 3</b>                 |   |
| <b>Geometry</b> 3                      | <u>Investigating angles in shapes</u>   |
| <b>GMS Milestone 1</b>                 |   |

| Strand and Activity Group Number   | Activity Group Title  |
|--|---|
| <b>Numbers and the Number System</b> 6   | <a href="#">Introducing decimal fractions</a>   |
| <b>Pattern and Algebra</b> 3   | <a href="#">Exploring 'equals' in balancing number sentences</a>                                  |
| <b>Calculating</b> 10  | <a href="#">Exploring the distributive property and developing written methods of multiplying</a> |
| <b>NPC Milestone</b>  4   |   |
| <b>Calculating</b> 11  | <a href="#">Using multiplying facts to solve dividing problems</a>                                |
| <b>Pattern and Algebra</b> 4   | <a href="#">Exploring multiples and factors</a>   |
| <b>Calculating</b> 12  | <a href="#">Developing fluency with the short written method of multiplying</a>                   |
| <b>Calculating</b> 13  | <a href="#">Developing fluency with the short written method of dividing</a>                      |
| <b>Calculating</b> 14  | <a href="#">Solving problems involving more than one step</a>                                     |
| <b>NPC Milestone</b>  5   |   |
| <b>Measurement</b> 1   | <a href="#">Finding times and durations, and using the 24-hour clock</a>                          |
| <b>GMS Milestone</b>  2   |   |
| <b>Pattern and Algebra</b> 5   | <a href="#">Looking for growing patterns in problem solving</a>                                   |
| <b>Geometry</b> 4  | <a href="#">Reading and plotting positions using coordinates</a>                                  |
| <b>Numbers and the Number System</b> 7   | <a href="#">Exploring equivalence in fractions and introducing proportion</a>                     |
| <b>Statistics and Probability</b> 1  | Statistical investigations and probability ( <i>coming soon</i> )                                 |
| <b>Numbers and the Number System</b> 8   | <a href="#">Introducing decimal fractions with two places</a>                                     |
| <b>Measurement</b> 2   | <a href="#">Calculating with money amounts</a>  |
| <b>Measurement</b> 3   | <a href="#">Understanding and using units of length and distance</a>                              |
| <b>GMS Milestone</b>  3 |   |
| <b>Measurement</b> 4   | <a href="#">Understanding and using units of mass</a>   |
| <b>Measurement</b> 5   | <a href="#">Understanding and using units of capacity and volume</a>                              |
| <b>Pattern and Algebra</b> 6   | <a href="#">Solving problems and puzzles systematically</a>                                       |
| <b>Measurement</b> 6   | <a href="#">Understanding perimeter and area</a>  |
| <b>GMS Milestone</b>  4 |   |
| <b>Pattern and Algebra</b> 7   | <a href="#">Exploring general rules, reasoning and logic</a>                                      |
| <b>NPC Milestone</b>  6 |   |

# Getting Started: Getting started with Number, Pattern and Calculating 4

**Key mathematical ideas** Pattern, Adding, Subtracting, Multiplying, Dividing, Place value, Mathematical thinking and reasoning

## Educational context

This activity group is to help children and teachers become familiar with structured apparatus including Numicon Shapes, number rods and base-ten apparatus, and to help them make connections between the patterns and structure they see and their number ideas.

Actions for the four calculating symbols are also introduced in this activity group. The activities provide essential opportunities for children to connect meanings with structured apparatus for themselves, and will give teachers valuable insights into children's mathematical understanding. This will help with initial assessing, which in turn may affect how teachers decide to group children. If children are not accustomed to working on open-ended activities some of their initial responses may be superficial, consequently they will need encouragement to persevere until they develop confidence to find things out for themselves.

Depending on children's previous experiences, allow two or three days for these activities before moving on to Calculating 1, Numbers and the Number System 1 and Pattern and Algebra 1.

## Learning opportunities

- To connect Numicon Shapes with number ideas.
- To connect number rods with number ideas.
- To connect structured apparatus with numerals, number words and positions on a number line.
- To see and explain patterns in number relationships illustrated with structured apparatus.
- To describe number relationships using mathematical language.
- To revise the mathematical language for calculating operations.
- To revise actions representing the symbols of arithmetic notation:  $+$ ,  $-$ ,  $=$ ,  $\times$ ,  $\div$ .
- To revise use of 'is less/fewer than' and 'is greater/more than' symbols ( $<$  and  $>$ ) respectively.
- To revise using the column methods of adding and subtracting and the short written methods of multiplying and dividing.

## Terms for children to use

number names to 100 and beyond, pattern, next, before, after, in between, ordinal number names (e.g. first, second, third), terms for comparing (e.g. small, smaller than, smallest, long, longer than, longest, few, fewer than, fewest, more than, less than, greater than), set, add, altogether, total, more, take away, subtract, difference, decrease, 'how many more to reach ...?', multiply, times, divide, share between, equal, visualize, column method, short written method

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
  - Notice and describe the attributes of Numicon Shapes and number rods and use these to sort both Shapes and rods in different ways.
  - Refer to Numicon Shapes and number rods by number name, order them and describe relationships between them.
  - Connect Numicon Shapes, number rods, numerals and number names with positions on a number line.
  - Recognize and use the language for adding, subtracting, multiplying and dividing and the symbols  $+$ ,  $-$ ,  $\times$ ,  $\div$ ,  $=$ ,  $<$  and  $>$ .
  - Use structured apparatus to illustrate their thinking.
  - Describe relationships they see in structured apparatus using mathematical language.
  - Use the column methods of adding and subtracting and the short written methods of multiplying and dividing effectively.
- If children have ongoing difficulties they are likely to need additional and differentiated support. Refer back to the *Number Pattern and Calculating 2 and 3 Teaching Resource Handbooks* for activities to establish children's understanding of earlier ideas. If any children are experiencing more fundamental difficulties, consider running the Numicon Intervention Programme for them.

## Explorer Progress Book 4a, pp. 2–3

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 1: Numicon Shape Pattern Hunt

After completing work on Activity 4, give children Explore More Copymaster 1: Numicon Shape Pattern Hunt (enlarged to A3) to take home.

## Focus activities

1. [What maths can you show with Numicon Shapes?](#)
2. [What maths can you show with number rods?](#)
3. [Knowing the Numicon Shape patterns](#)
4. [Describing relationships between Numicon Shapes or number rods](#)
5. [Cover the board with Numicon Shapes](#)
6. [Supporting calculating with Numicon Shapes or number rods](#)
7. [What maths can you show with base-ten apparatus](#)

# Calculating 1: Using adding and subtracting facts and understanding inverse relationships

**Key mathematical ideas** Adding, Subtracting, Inverse, Pattern, Mathematical thinking and reasoning

## Educational context

This activity group starts with revision of known adding and subtracting facts for 10, 20 and 30, then extends this to looking for patterns in adding and subtracting facts within 100 and 1000. Children revise the inverse relationship between adding and subtracting as they explore 'trios' of numbers up to 100 (they have met number trios in *the Number, Pattern and Calculating 3 Teaching Resource Handbook*, Pattern and Algebra 1). They then use this inverse relationship when calculating change in money problems and in solving capacity and mass problems. They will call on their knowledge of adding and subtracting facts to 100 and the inverse relationship as they work on the final activity, in which they explore number problems, adjusting the numbers involved to make calculations easier and to generate further calculations.

## Learning opportunities

- To recognize that patterns for adding and subtracting facts of 10 recur in adding and subtracting facts of other multiples of 10.
- To recognize when to use the inverse relationship between adding and subtracting, including when giving change in money problems and when calculating with measures.
- To learn adding and subtracting facts of number pairs that total 100 and to use these to find number pairs that total 1000.
- To use the inverse relationship between adding and subtracting to check totals are correct.

## Terms for children to use

add, sum, total, subtract, difference, equals, number trio, doubles fact, general rule, multiple of 10, multiple of 100, adjust, gram, kilogram, millilitre, litre

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children use effectively.
- Predict from a pattern to make a generalization.
- Explain using an inverse relationship to find missing numbers in adding or subtracting calculations.
- Use the inverse relationship between adding and subtracting to work out change when solving money problems.
- Apply knowledge of number facts to 100 and 1000 in calculations involving measures.

## NPC Milestone 1

- To know and use patterns in adding and subtracting facts for any multiple of 10 (NPC 4:1h)
- To have fluent recall of adding and subtracting facts to 10 to derive adding and subtracting facts to 100 (NPC 4:1i)
- To use the inverse relationship between adding and subtracting to check totals are correct (NPC 4:1k)

## Explorer Progress Book 4a, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 17: Supermarket Spend

After completing work on Activity 4, give children Explore More Copymaster 17: Supermarket Spend to take home.

## Pupil Book 4, pp. 2–5

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Using adding and subtracting facts of 10 with larger multiples of 10](#)
2. [Strategies for finding missing numbers](#)
3. [Using number pairs that total 100 to explore inverse relationships](#)
4. [Using adding and subtracting facts to work out change in money problems](#)
5. [Using adding and subtracting facts to 1000 in capacity problems](#)
6. [Using adding and subtracting facts to 1000 in problems involving mass](#)
7. [Using adding and subtracting in problem-solving activities](#)

# Numbers and the Number System 1: Understanding place value in 4-digit numbers

**Key mathematical ideas** Counting, Place value, Ordering, Mathematical thinking and reasoning

## Educational context

The activities in this group are designed to consolidate children's understanding of numbers to 1000 and to begin to extend this up to 10 000. This understanding of numbers and the number system is fundamental to children's ability to calculate mentally, e.g.  $9742 - 2700 = 7042$ , and also for their written calculations involving thousands, hundreds, tens and ones.

There are suggestions for involving children in enhancing the mathematical learning environment, including building a number line to 1000, and in the continued use of structured apparatus, to help them develop a sense of the cardinal value of numbers and make connections between column value and quantity value.

The various activities are set in different contexts to help children link their understanding of the numbers used to work with measures. Contrasting different number systems used by other cultures helps children to realize that the base-ten system is used in other cultures but numbers may be represented in other ways.

## Learning opportunities

- To develop understanding of the quantity and column value of numbers to 1000, extending to 10 000.
- To find the position of numbers to 1000 on a number line.
- To know that 1000 is equivalent to 10 groups of 100.
- To be able to visualize, describe or draw 2-, 3- and 4-digit numbers.
- To understand the role of 0 as a placeholder.
- To connect knowledge of numbers to measures.
- To appreciate that the base-ten system is used in other cultures.

## Terms for children to use

estimate, in between, number names to 10 000, place value, base-ten, multiples of 100, 3-digit number, 4-digit number, placeholder, zero, column value, quantity value

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Make reasonable estimates of amounts over 100.
- Can explain 0 as a placeholder.
- Can explain the column value and quantity value of numbers, e.g. 'The quantity value is three hundred and we write this as three hundreds, zero tens and zero ones'
- Know that multiples of 10 and 100 are useful 'staging posts' for finding numbers on a number line.
- Represent numbers with different kinds of apparatus, including place value grids and calculators, and by writing and drawing.
- Use knowledge of number when measuring grams and kilograms and with other ones of measure.
- Recognize which numbers fall within a range.
- Can explain that other number systems which may be written differently still use the base-ten system.

## NPC Milestone 1

- To give a sensible estimate of amounts of more than 100 objects (NPC 4:1a)
- To read, write and build 4-digit numbers with apparatus and say the value of each digit (NPC 4:1c)

## Explorer Progress Book 4a, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 9: Higher or Lower

After completing work on Activity 5, give children Explore More Copymaster 9: Higher or Lower to take home.

## Pupil Book 4, pp. 6–9

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Estimating beyond 100](#)
2. [Making a 0–1000 number line](#)
3. [Visualizing numbers to 1000](#)
4. [Exploring quantity value with a counters game](#)
5. [Making connections between quantity and column values](#)
6. [Exploring place value with masses](#)
7. [Exploring number systems used by other cultures](#)

# Pattern and Algebra 1: Exploring sequences and number patterns

**Key mathematical ideas** Generalizing, Pattern, Mathematical thinking and reasoning

## Educational context

In this activity group, children are encouraged to think about the different strategies they can use to find missing terms in a sequence. Number rods and the Numicon 1–100 cm Number Rod Track are used to provide helpful illustrations of these ideas.

The strategy of looking for patterns in sequences is introduced in the context of sequences of familiar multiples. This is extended to children looking for patterns in multiples of 11, then in multiples of 10, 100, 21, 31, etc.

The activities move on to explore other sequences involving regular increases and decreases. The strategy of looking for a constant difference in sequences in order to find missing numbers is introduced using number rods, then applied to finding missing amounts in measuring contexts where quantities increase or decrease by a constant amount each time.

## Learning opportunities

- To know that remembering sequences of multiples can help with finding missing terms.
- To know that finding a constant difference can help with finding missing terms.
- To notice connections between sequences of different multiples.

## Terms for children to use

multiple, term, ordinal number words (e.g. first, second, third), interval, constant difference, sequence, increasing sequences, decreasing sequences, ones-digit pattern, rule, scale

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Recognize sequences of multiples.
- Predict which terms are missing in sequences of multiples.
- Explain connections between patterns in the sequences of multiples of 10 and multiples of 1.
- Recognize and describe sequences built with number rods.
- Find differences between terms in increasing and decreasing sequences built with number rods.
- Describe a sequence of increasing measurements on a scale and explain the constant difference as an amount.
- Use the idea of constant difference to find missing numbers in sequences, including on measuring scales.

## NPC Milestone 1

- To recognize and count forwards and backwards in sequences of multiples of all numbers to 12 (NPC 4:1e)
- To notice patterns in sequences of multiples, explain the rule for the sequence and use this to find missing numbers (NPC 4:1f)
- To use the idea of constant difference to find missing numbers in sequences (NPC 4:1g)

## Explorer Progress Book 4a, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 2: Safe Cracker

After completing work on Activity 3, give children Explore More Copymaster 2: Safe Cracker to take home.

## Pupil Book 4, pp. 10–13

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Making sequences of multiples with number rods and Numicon Shapes](#)
2. [Exploring patterns in sequences of multiples](#)
3. [Comparing sequences of multiples and looking for patterns](#)
4. [Making sequences using multiples of 10](#)
5. [Exploring other sequences with number rods](#)
6. [Using number rods to find missing information in sequences with constant differences](#)
7. [Sequences in measuring problems](#)



# Numbers and the Number System 2: Ordering and comparing numbers to 1000 and beyond

**Key mathematical ideas** Counting, Place value, Ordering, Mathematical thinking and reasoning

## Educational context

The activities in this group provide opportunities for children to use their understanding of 4-digit numbers in realistic and cross-curricular contexts, so that they learn how important and useful it is to be able to compare and order numbers to 10 000.

We have used the conventional Gregorian calendar for ordering historical events, however the activity could be extended using another calendar convention.

Children also revisit the conventions used for comparing numbers using the symbols  $<$  and  $>$ , while the dash symbol ( $-$ ) is introduced carefully to ensure that children realize that it can be written between two numbers to indicate a range and is written without spaces to distinguish it from a minus sign. The activities extend children's earlier experiences of finding unknown numbers by questioning and eliminating possibilities, as they now develop questioning strategies to help them identify and narrow a range of possible numbers.

## Learning opportunities

- To order and compare numbers greater than 1000.
- To describe relationships between numbers and record them using the  $<$  and  $>$  symbols.
- To find given numbers in the ordered range 1000–10 000.
- To use the symbol ' $-$ ' between two numbers to indicate a range.
- To use knowledge of relationships between numbers in the range 1000–10 000 in different contexts.
- To ask appropriate questions when seeking an unknown number to narrow down the range of possible answers.

## Terms for children to use

number range, system of numbering, birth years, significant digit, compare, estimate, nearly, nearest, in between, greater than, less than, eliminate possibilities, narrow the range, monetary value, convention, cheap, expensive

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use in conversation effectively.
- Describe relationships between numbers greater than 1000 and use the  $<$  and  $>$  symbols.
- Recognize and explain the significant digits when ordering 4-digit numbers.
- Recognize and use the symbol ' $-$ ' between two numbers to indicate a number range.
- Ask appropriate questions when seeking an unknown number to eliminate possibilities by narrowing a number range.

## NPC Milestone 1

- To count aloud across multiples of 100 and multiples of 1000 to 10 000 (NPC 4:1b)
- To order and compare numbers to 1000 (NPC 4:1d)

## Explorer Progress Book 4a, pp. 10–11

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 10: Space Probe

After completing work on Activity 2, give children Explore More Copymaster 10: Space Probe (enlarged to A3) to take home.

## Pupil Book 4, pp. 14–17

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Writing numbers in a range](#)
2. [Ordering 4-digit numbers within an historical context](#)
3. [Finding pages in a book](#)
4. [Playing a place value domino game](#)
5. [Narrowing the range](#)
6. [Finding numbers within a range](#)

# Calculating 2: Strategies for bridging when adding and subtracting

**Key mathematical ideas** Adding, Subtracting, Mathematical thinking and reasoning

## Educational context

Bridging is a highly useful strategy in mental calculating, and also helps to prepare children for the formal written methods of adding and subtracting (this is introduced in Calculating 8). These activities take children carefully through the bridging process to consolidate their understanding of bridging, which they met previously (see the Number, Pattern and Calculating 2 and 3 Teaching Resource Handbooks). First there is revision of bridging multiples of 10, which they have met in previous work, using recall of adding facts, knowledge that multiples of 10 are useful stepping stones when calculating and the ability to record the steps involved on an empty number line. This work is extended to bridging multiples of 10 when adding and subtracting 2-digit numbers, looking first at adding and then at subtracting, and extended again to introduce bridging 100 and multiples of 10 between 100 and 200, before bridging other multiples of 100.

## Learning opportunities

- To consolidate understanding that bridging multiples of 10 when calculating involves partitioning and adding or subtracting in two steps.
- To revise the use of a portion of an empty number line to record the steps in bridging a multiple of 10.
- To use strategies to bridge multiples of 100, 1000 and 3-digit multiples of 10.

## Terms for children to use

estimate, add, subtract, balancing calculation, bridging, multiple of 100, partition

## Assessment opportunities

Look and listen for children who can:

- Use the words and terms for use in conversation effectively.
- Use an empty number line to show the steps taken in bridging a multiple of 10.
- Use recalled adding facts to partition numbers when calculating by bridging a multiple of 10.
- Use recalled subtracting facts to partition numbers when calculating by bridging a multiple of 10.
- Record a bridging problem and its solution as a balancing calculation.
- Recall pairs of numbers equalling 100 to partition numbers when bridging 100.

## NPC Milestone 1

- To recall adding and subtracting facts to add and subtract single digit numbers to/from any number to 1000 (NPC 4:1j)

## Explorer Progress Book 4a, pp. 12–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 18: Target 100

After completing work on Activity 3, give children Explore More Copymaster 18: Target 100 to take home.

## Pupil Book 4, pp. 18–21

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Bridging multiples of 10 when adding](#)
2. [Bridging multiples of 10 when subtracting](#)
3. [Bridging through multiples of 10 when adding 2-digit numbers](#)
4. [Bridging through multiples of 10 when subtracting 2-digit numbers](#)
5. [Bridging through 100 when adding](#)
6. [Bridging through 100 when subtracting](#)

# Numbers and the Number System 3: Estimating and rounding

**Key mathematical ideas** Counting, Place value, Mathematical thinking and reasoning

## Educational context

The activities in this group draw extensively on children's understanding of place value in numbers to 10 000, and of the relationships between them. The idea of rounding (covered in the *Number, Pattern and Calculating 3 Teaching Resource Handbook*, Numbers and the Number System 6 and Calculating 13) is revised and consolidated, with rounding numbers within 100 to the nearest multiple of 10 being extended to rounding 3- and 4-digit numbers to the nearest multiple of 10, 100 or 1000. Children are encouraged to look for patterns in similar rounding situations, e.g. when rounding 8, 18, 80, 800, ... .

The activities are set in realistic contexts in which rounding is used, providing interesting opportunities for making links with other areas of the curriculum. These activities should be revisited several times during the year through such cross-curricular links. The ability to round is highly useful to children's calculating, for example when they are estimating the range of numbers within which an answer is likely to fall, deciding which strategy to use and checking whether an answer is reasonable.

## Learning opportunities

- To realize that estimates are not exact amounts, and are often given as 'round' multiples of 10, 100 or 1000.
- To use knowledge of number relationships and multiples when solving problems involving length, mass and capacity.
- To know which unit, e.g. centimetres or metres, is most suitable for measuring in particular situations.
- To realize that rounding is a useful technique in many calculating situations.

## Terms for children to use

rounding, round amounts, round numbers, roughly, nearest multiple of ... , closer to, nearer to, nearly, approximately, approximate, estimation, estimate

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Explain that we often talk about 'rough' or 'approximate' amounts.
- Locate a number and the multiple of 10 closest to it on a number line.
- Recognize situations in which it is useful to estimate.
- Know when to use rounding to simplify calculations and give an approximate answer.
- Use a rough sense of a calculation to help check their solution.
- Round 3- or 4-digit numbers to a multiple of 10, 100 or 1000.

## NPC Milestone 2

- To give a rounded estimate of amounts to 1000 (NPC 4:2a)
- To round any number to the nearest 10, 100 or 1000 (NPC 4:2b)
- To connect estimation and rounding numbers to the use of measuring instruments (NPC 4:2c)
- To use the strategy of rounding numbers and adjusting to make calculations easier (NPC 4:2d)

## Explorer Progress Book 4a, pp. 14–15

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 11: Fruit Juice

After completing work on Activity 2, give children Explore More Copymaster 11: Fruit Juice to take home.

## Pupil Book 4, pp. 22–25

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Round amounts and approximations in everyday use](#)
2. [Measuring to the nearest 10](#)
3. [Estimating to the nearest metre or the nearest 100](#)
4. [Rounding to the nearest metre](#)
5. [Rounding to the nearest 1000](#)
6. [Rounding in other contexts](#)
7. [Rounding calculations](#)

# Geometry 1: Classifying triangles and quadrilaterals

**Key mathematical ideas** Describing parts and properties of shapes invariant under transformations, Classifying shapes, Equivalence

## Educational context

This activity group builds on children's work in the *Geometry, Measurement and Statistics 3 Teaching Resource Handbook* to add to their understanding of the parts and properties of geometrical shapes as they are conventionally defined, and to develop their knowledge of different types of triangles and quadrilaterals.

By actively making and drawing, sorting and ordering examples children are encouraged to find out about how triangles can be classified. They are introduced to the conventional categories of equilateral, isosceles, scalene and right-angled triangles in this context. Similarly, they actively investigate the similarities and differences in the properties of different quadrilaterals and how they may be classified, and in this way meet trapeziums, parallelograms, rhombuses, rectangles, squares, kites and other quadrilaterals as interrelated sets.

Children also work out how different types of quadrilaterals can be made by combining different types of triangles. This provides them with another perspective on the structure of 2D shapes, and represents an early step towards considering the internal angles of polygons (which they will meet more formally in later geometry work).

Finally, children are encouraged to consolidate and refine what they have learned by considering how a variety of triangles and quadrilaterals can be named and sorted. The challenge can be extended by inviting them to devise their own methods of sorting and to add further shapes to the sets they have made.

In the course of this work children encounter a wide variety of geometrical properties and mathematical terms, some of which they have encountered previously and some which will be new. Throughout, ensure that the focus remains on reasoning about the properties of shapes (rather than, for example, learning their names); the conventional terms used and the categories they refer to are based on shared, invariant properties of shapes, and these properties provide the foundation for children's understanding.

## Learning opportunities

- To understand how different polygons can be constructed by combining triangles.
- To sort, classify and name triangles and quadrilaterals based on their properties.
- To create and use sorting diagrams, e.g. Venn, Carroll and tree diagrams.

## Terms for children to use

equilateral triangle, isosceles triangle, scalene triangle, right-angled triangle, quadrilateral, trapezium, parallelogram, rhombus, rectangle, oblong, square, kite, concave kite, dart, arrow, other polygon names (pentagon, hexagon, heptagon, etc.), 2D shape, polygon, side length, equal angles, acute angle, right angle, obtuse angle, parallel, perpendicular, regular, irregular, congruent, sorting diagram, Carroll diagram, Venn diagram, tree diagram

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Sort and classify triangles and quadrilaterals based on their properties.
- Identify, name, and make or draw equilateral, isosceles, scalene and right-angled triangles, and trapeziums, parallelograms, rhombuses, rectangles, oblongs, squares, kites and other quadrilaterals.
- Explain the differences and similarities between different types of triangle or quadrilateral, e.g. between a right-angled isosceles triangle and an isosceles triangle, or a square and a rhombus.
- Categorise within an umbrella category, e.g. a square as a rectangle, a rectangle as a parallelogram, a parallelogram as a quadrilateral, a quadrilateral as a polygon.
- Combine triangles to make a quadrilateral, and identify the quadrilateral.
- Sort and classify shapes according to given criteria.
- Understand the types of shapes that belong in each part of a sorting diagram, e.g. in the intersection of sets on a Venn diagram.
- Identify suitable criteria for sorting a given collection of shapes, and draw and label an appropriate sorting diagram

## GMS Milestone 1

- Make or draw different triangles, using properties of sides and angles to name them, e.g. scalene, right-angled (GMS 4:1a)
- Make or draw different quadrilaterals, using properties of sides and angles to name them, e.g. oblong, trapezium, kite (GMS 4:1b)
- Explain how polygons are classified within umbrella categories, e.g. square, rectangle, parallelogram, quadrilateral, polygon (GMS 4:1c)
- Use sorting diagrams to categorize collections of shapes according to chosen criteria (GMS 4:1d)

## Explorer Progress Book 4, pp. 2–3

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 1: Triangle Puzzle

After completing work on Activity 3, give children Explore More Copymaster 1: Triangle Puzzle to take home.

## Pupil Book 4, pp. 26–29

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Classifying and naming types of triangle](#)
2. [Classifying and naming types of quadrilateral](#)
3. [Making quadrilaterals with triangles](#)
4. [Sorting and classifying triangles and quadrilaterals](#)

# Calculating 3: Developing fluency with mental adding strategies

**Key mathematical ideas** Adding, Pattern, Mathematical thinking and reasoning

## Educational context

This group of activities is designed to extend children's repertoire of calculating strategies, focusing on adding. Success with this work requires children to have: secure understanding of place value and number relationships; fluent recall of adding facts; understanding of the two adding structures – combining quantities (aggregation) and increasing by adding more (augmentation) – and equivalence; understanding of the inverse relationship between adding and subtracting; and the ability to use understanding of number relationships to round and adjust numbers.

Once children have explored the different strategies, the final two activities involve them in solving problems by deciding which strategy is most appropriate.

## Learning opportunities

- To know that quickly adding multiples of 10 is a useful strategy in mental calculating.
- To use the strategy of partitioning numbers in different ways to make adding calculations easier.
- To realize that adding strategies apply to problems where two or more values are combined or one value increases.
- To use the strategy of rounding numbers and adjusting to make adding calculations easier.
- To use compensating as a non-computational adding strategy.
- To know it is important to look carefully at the numbers involved in a calculation before deciding which strategy to use.

## Terms for children to use

strategy, multiples of 10, compare, hundreds, tens, units, partition, balancing calculation, bridging, rounding, adjusting, compensate, is equal to, is not equal to, number trio, double, add, sum, total, number facts, adding, increase

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Quickly carry out calculations involving several multiples of 10.
- Round numbers in a calculation to multiples of 10 and explain their decisions.
- Look carefully at the numbers involved in a calculation and weigh up alternative strategies.
- Round numbers and adjust to make calculation easier.
- Look carefully at a calculation and, without calculating, suggest one that is equivalent.
- Look carefully at a calculation, choose a strategy for carrying it out and give reasons for why it is the most appropriate.

## NPC Milestone 2

- To use the strategy of partitioning in different ways to simplify adding and subtracting calculations (NPC 4:2e)
- To use the strategy of adding or subtracting multiples of 10 in mental calculating (NPC 4:2f)

## Explorer Progress Book 4a, pp. 16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 19: Cycle Tour

After completing work on Activity 5, give children Explore More Copymaster 19: Cycle Tour to take home.

## Pupil Book 4, pp. 30–33

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Adding several multiples of 10](#)
2. [Using a partitioning strategy to add 2- or 3-digit numbers](#)
3. [Adding by rounding and adjusting](#)
4. [Adjusting adding sentences – non-computational reasoning](#)
5. [Adding 2-digit doubles](#)
6. [Choosing strategies for adding 2-digit numbers](#)
7. [Finding the total of items in a list](#)

# Calculating 4: Developing fluency with mental subtracting strategies

**Key mathematical ideas** Subtracting, Pattern, Mathematical thinking and reasoning

## Educational context

This group of activities builds on the activities in Calculating 3, and is designed to extend children's repertoire of calculating strategies, focusing on subtracting. Success with this work requires children to have: secure understanding of place value and number relationships; fluent recall of subtracting facts; understanding of the four subtracting structures (take away, decrease, comparison and inverse of adding); understanding of equivalence; understanding of the inverse relationship between adding and subtracting; and the ability to use understanding of number relationships to round and adjust numbers. Once children have explored the different strategies, the final activity involves them in solving problems by deciding which strategy is most appropriate.

## Learning opportunities

- To know that quickly subtracting multiples of 10 is a useful strategy in mental calculating.
- To recognize the language for the 'difference' and 'take away' structures of subtracting.
- To realize that subtracting strategies apply to problems involving finding a difference in value, losing or taking away an amount, and decrease.
- To use inverse adding facts to check subtracting calculations.
- To use the strategy of partitioning numbers in different ways to make calculations easier.
- To use the strategy of rounding numbers and adjusting to make calculations easier.
- To use compensating as a non-computational subtracting strategy.
- To know it is important to look carefully at the numbers involved in a calculation before deciding which strategy to use.

## Terms for children to use

strategy, multiples of 10, compare, hundreds, tens, ones, partition, balancing calculation, subtract, difference, take away, bridging, rounding, adjusting, compensate, is equal to, is not equal to, number trio, double, halve, number facts

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Quickly subtract multiples of 10.
- Round numbers in a calculation to multiples of 10 and explain their decisions.
- Recognize 'difference' and 'take away' as subtracting structures.
- Use the inverse relationship between adding and subtracting and patterns in similar calculations to find missing numbers.
- Look carefully at a calculation and, without calculating, suggest one that is equivalent.
- Look carefully at the numbers involved in a calculation and weigh up alternative strategies.

## NPC Milestone 2

- To use compensating as a non-computational strategy for adding and subtracting (NPC 4:2g)
- To know that it is important to look carefully at the numbers involved in a calculation before deciding which strategy to use (NPC 4:2h)

## Explorer Progress Book 4a, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 20: High Climber

After completing work on Activity 3, give children Explore More Copymaster 20: High Climber to take home.

## Pupil Book 4, pp. 34–37

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Exploring 'difference' and 'take away' structures with multiples of 10](#)
2. [Looking for patterns in similar calculations](#)
3. [Subtracting by rounding and adjusting](#)
4. [Adjusting subtracting sentences – non-computational reasoning](#)
5. [More partitioning and subtracting using apparatus](#)
6. [Finding how much more or how much less](#)
7. [Choosing strategies for subtracting 2-digit numbers](#)

# Calculating 5: Developing fluency with multiplying facts to $12 \times 12$

**Key mathematical ideas** Multiplying, Pattern, Mathematical thinking and reasoning

## Educational context

This activity group is about revising all the multiplying structures that were introduced in Number, Pattern and Calculating 3, and continuing to develop children's fluency in calculating. The children will meet a range of multiplying problems in a variety of contexts, including correspondence problems where  $n$  objects are connected to  $m$  objects. A variety of imagery is used to support children's understanding, and to support them memorizing times tables facts. Key connections are made to everyday contexts (including measuring) in which multiplying is used. The activities in this group can be adapted with any of the times tables as a focus, according to children's abilities, in order to help them consolidate and learn multiples to  $12 \times 12$  off by heart, both in sequence and at random.

## Learning opportunities

- To interpret an array as a model of multiplying.
- To know that multiplying is what we do instead of adding repeated groups.
- To record sequences of multiples systematically in a table, and read products.
- To find products on multiplying squares.
- To know the effects of multiplying by 0 and by 1.
- To learn and improve fluency with the times tables up to  $12 \times 12$ .
- To know that we multiply to find the area of rectangles.
- To recognize that we multiply by numbers greater than 1 to scale up an amount.

## Terms for children to use

multiply, times, lots of, groups of, sets, array, product, multiplying sentences, multiplication tables, times tables, times tables square, commutative, multiplying facts, multiples, dimension, length, width, rectangle, square, area, multiplied by, scaling, scaled up by

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Write multiplying sentences for problems involving repeated amounts.
- Find products of two numbers on multiplying squares.
- Write two multiplying sentences for an array and notice that, e.g.  $4 \times 6$  and  $6 \times 4$  give the same product.
- Recall multiplying facts to  $12 \times 12$ .
- Explain the effects of multiplying by 0 and by 1.
- Illustrate a scaling problem with apparatus and a multiplying sentence.

## NPC Milestone 2

- To recall multiplying and dividing facts for multiplication tables up to  $12 \times 12$  (NPC 4:2i)
- To generalize and explain the effects of multiplying by 0 and by 1 (NPC 4:2j)

## Explorer Progress Book 4a, pp. 20–23

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 22–23) where they can reflect on the mathematics they have done so far.

## Explore More Copymaster 21: Multiply Game

After completing work on Activity 5, give children Explore More Copymaster 21: Multiplying Game (enlarged to A3) to take home.

## Pupil Book 4, pp. 38–41

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Exploring a multiplying context](#)
2. [Writing multiplying sentences](#)
3. [Making a table for multiplying](#)
4. [Using arrays to explore the commutative property of multiplying](#)
5. [Improving fluency with multiplying facts](#)
6. [Making connections between multiplying and finding the area of rectangles](#)
7. [Using scaling in a recipe problem](#)
8. [Using a 'correspondence' structure to work out how many partners](#)

# Calculating 6: Developing fluency with dividing facts to $12 \times 12$

**Key mathematical ideas** Dividing, Inverse, Mathematical thinking and reasoning

## Educational context

This activity group is about revising all the dividing structures that were developed in Number, Pattern and Calculating 3 and continuing to develop children's fluency in calculating. The children will meet a range of dividing problems in a variety of contexts including correspondence problems. A variety of imagery is used in order to support children's understanding, and emphasis is placed on the use of multiplying facts when dividing. Key connections to everyday contexts in which dividing is used continue to be exploited, including sharing situations in which  $i$  objects correspond to  $m$  children. These activities can be adapted to focus on different dividing facts, according to children's needs and their progress in recalling multiplying facts to  $12 \times 12$ .

## Learning opportunities

- To use the inverse relationship between multiplying and dividing.
- To write dividing sentences using the  $\div$  symbol.
- To recognize that there are three structures for dividing (grouping, sharing and ratio) and that all use the  $\div$  symbol.
- To learn the related dividing facts for times tables to  $12 \times 12$ .
- To realize two dividing facts can be derived from a multiplying fact.
- To know that multiplying facts can help us to find numbers that are missing in dividing situations.
- To recognize that we divide when we are solving problems where we have to find 'how many ... in ...', when sharing into equal amounts and when scaling down.
- To know that we divide when working out one dimension of a rectangle from its area and the other dimension.

## Terms for children to use

dividing, multiplying, total, array, dividing symbol, dividing sentences, systematically, dividing facts, grouping, how many in, divided into, inverse, sharing, divided equally, dividing by, shared equally, sharing between, sharing amongst, area, dimensions, squares, rectangles, sides, length, scaling, scale down, half, halving, half the amount, halve the amount, half as much as, groups of

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Write dividing sentences using the  $\div$  symbol.
- Write two dividing sentences for an array.
- Use knowledge of multiplying facts to work out dividing facts.
- Recall dividing facts related to multiplying facts to  $12 \times 12$ .
- Explain that we divide to find 'how many ... in ...', when 'sharing ... into ...' and when scaling down, and know that all these cases can be written as dividing sentences.

## NPC Milestone 2

- To use the commutative property of multiplying and the inverse relationship between dividing and multiplying to speed up fluent recall of multiplying and dividing facts (NPC 4:2k)

## Explorer Progress Book 4b, pp. 2–3

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 22: Farm Fencing

After completing work on Activity 2, give children Explore More Copymaster 22: Farm Fencing to take home.

## Pupil Book 4, pp. 42–45

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Exploring a dividing context](#)
2. [Writing dividing sentences](#)
3. [Finding two dividing facts from an array](#)
4. [Improving fluency with dividing facts](#)
5. [Using the inverse to derive missing numbers](#)
6. [Dividing in a correspondence context](#)
7. [Dividing in the context of working with areas](#)
8. [Dividing in a scaling problem](#)



# Pattern and Algebra 2: Exploring inverse relationships

**Key mathematical ideas** Inverse, Adding, Subtracting, Multiplying, Dividing, Equivalence, Non-computational thinking, Mathematical thinking and reasoning

## Educational context

This activity group begins by revising the inverse relationship between adding and subtracting using 2-digit numbers with the familiar number trios and missing number problems (Calculating 1). Number trios are then extended to networks of trios with two and three levels, inviting children to call on their understanding of inverse as they look for patterns to identify which numbers work and which do not.

Inverse relationships are then explored through adding grids, doubling and halving with 2-digit numbers and multiplying and dividing. Importantly, in Activity 5 children meet a structure for recording that will begin to prepare them for the idea of a function.

There are further opportunities to use inverse to complete empty box problems and to work out a hidden number using 'clues'. Finally, children are encouraged to use inverse relationships to spot errors when checking calculations.

## Learning opportunities

- To use the inverse relationships between adding and subtracting and between multiplying and dividing with 2-digit numbers.
- To notice that adding and multiplying have a commutative property but subtracting and dividing do not.
- To understand the inverse relationship between doubling and halving.
- To use inverse to solve a variety of problems.
- To know that using inverse relationships can be a useful way of checking calculations.

## Terms for children to use

part, whole, inverse, number trios, related facts, family of facts, generalize, inverse relationship, systematic, adjusting, halving, doubling, solution, multiplying, dividing, commutative, array, rotated array

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Use the inverse relationship between adding and subtracting to derive families of facts from number trios.
- Extend number trios by deriving other related numbers.
- Use knowledge of inverse facts to complete adding grids.
- Use the inverse relationship between doubling and halving to derive facts from number trios.
- Record multiplicative relationships as number trios.
- Illustrate the inverse relationship between multiplying and dividing using an array.
- Use the inverse relationship between multiplying and dividing to derive families of facts from number trios.
- Use inverse facts to find solutions to problems when we know the result but not the starting number or amount.
- Work out a hidden number by following clues that involve inverse relationships.
- Illustrate part-whole relationships as number trios and number sentences.

## NPC Milestone 3

- To use inverse relationships between multiplying and dividing to record number trios and find solutions to different problems including missing number problems (NPC 4:3e)
- To be able to explain how to use inverse operations to check answers to a calculation (NPC 4:3f)

## Explorer Progress Book 4b, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 3: Trio Challenge

After completing work on Activity 2, give children Explore More Copymaster 3: Trio Challenge to take home.

## Pupil Book 4, pp. 46–49

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Exploring inverse](#)
2. [Finding inverse facts](#)
3. [Exploring the inverse relationship between doubling and halving](#)
4. [Exploring the inverse relationship between multiplying and dividing](#)
5. [Turn around game](#)
6. [Working backwards to solve problems](#)
7. [Playing number detective](#)
8. [Checking calculations](#)

# Calculating 7: Mental strategies for multiplying and dividing by 10 and 100

**Key mathematical ideas** Multiplying, Dividing, Pattern, Mathematical thinking and reasoning

## Educational context

The activities in this group draw on children's previous work on multiplying and dividing and their understanding of place value to explore situations using the 'scaling' structure of multiplying and 'ratio' structure of dividing. They provide opportunities to learn the mathematical language associated with these structures and to consider how to represent problems with structured apparatus.

Children are given time to find a rule for multiplying by 10 to encourage them to understand that commutated multiplying facts are equivalent and that this is useful when they are solving multiplying and dividing problems. As children multiply by 10 or 100 they apply familiar patterns to work with a wider range of numbers. They also use these ideas to convert between different units of measure and to solve problems where there is an unknown number. This idea is extended further as children use known multiplying facts to multiply by whole tens or hundreds.

## Learning opportunities

- To know that we scale up to increase an amount a given number of times.
- To represent scaling problems with structured apparatus.
- To spot patterns and generalize about multiplying or dividing by 10.
- To relate multiplying or dividing by 10 to multiplying or dividing by 100.
- To use knowledge of multiplying 1-digit numbers to multiply by whole tens or hundreds.

## Terms for children to use

ten times larger/longer/smaller, scaling up/down, ... times longer, scaled up/down by, multiplied by, multiplied ... times, general rule, commutative, multiplying sentences, dividing sentences, multiples of 10, multiples of 100, place value, ones column, tens column, hundreds column, inverse, grouping, sharing, ratio

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Notice regular patterns when multiplying or dividing by 10.
- Explain what always happens when multiplying or dividing by 10.
- Notice regular patterns when multiplying or dividing by 100.
- Explain what always happens when multiplying or dividing by 100.
- Use known multiplying facts to derive facts for multiplying with whole tens or hundreds, e.g. use  $3 \times 5$  to derive  $3 \times 50$  and  $3 \times 500$ .

## NPC Milestone 3

- To explain a general rule for multiplying and dividing by 10 and 100 (NPC 4:3j)

## Explorer Progress Book 4b, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 23: Ten Times

After completing work on Activity 5, give children Explore More Copymaster 23: Ten Times to take home.

## Pupil Book 4, pp. 50–53

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Multiplying by 10 in a scaling problem](#)
2. [Finding a rule for multiplying by 10](#)
3. [Dividing multiples of 10 by 10](#)
4. [Making connections between multiplying by 10 and place value](#)
5. [Making connections between dividing by 10 and place value](#)
6. [Exploring connections between multiplying and dividing by 10](#)
7. [Multiplying and dividing by 100](#)
8. [Linking multiplying facts and place value](#)

# Geometry 2: Understanding reflective symmetry

**Key mathematical ideas** Rotation, Reflection, Translation, Equivalence

## Educational context

The activities in this group guide children to build on their existing knowledge of reflective symmetry (also called bilateral, line or mirror symmetry) and to extend their use of reflecting (one of the four basic types of geometrical transformation) as a means of understanding shape and space. They begin by revisiting examples of symmetry in real life – in designs for aeroplanes or boats, for instance – and using these examples to link ideas about reflection, balance and movement with symmetry. They use these ideas to help them create and complete symmetrical patterns, and to look at and describe symmetry in dynamic (rather than purely static) terms.

Children also explore lines of symmetry at various angles. This implicitly involves rotation (another basic transformation), and children may demonstrate understanding of this through rotating patterns or shapes, or by talking about how a line of symmetry appears to have been turned. They also encounter this idea in looking at multiple lines of symmetry, when considering symmetry as a property of 2D shapes. Building on their work in Geometry 1, they identify symmetry in different types of triangle and quadrilateral, before moving on to consider regular polygons, circles and other shapes. The special case of a circle (in which any diameter is also a line of symmetry) is also explored.

## Learning opportunities

- To find and draw lines of symmetry in different types of triangle and quadrilateral, and in regular polygons.
- To understand that a circle has an infinite number of lines of symmetry.
- To identify and draw lines of symmetry in 2D shapes in any orientation.
- To make or draw a symmetrical pattern or shape with a vertical, horizontal or diagonal line of symmetry.
- To complete a symmetrical pattern or shape, given a vertical, horizontal or diagonal line of symmetry.
- To reason about and persist in exploring different ways of approaching a problem.

## Terms for children to use

symmetry, symmetrical, asymmetry, line of symmetry, mirror line, reflect, reflection, balance, orientation, vertical, horizontal, perpendicular, parallel, diagonal, polygon, congruent, similar, regular, irregular, angle, turn, right angle, midpoint, equilateral, isosceles, scalene, right-angled, square, oblong, rectangle, parallelogram, rhombus, trapezium, isosceles trapezium, kite, irregular quadrilateral, other polygon names (pentagon, hexagon, heptagon, and so on), circle, congruent, similar, grid

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Describe the symmetry of different types of triangle and quadrilateral, and regular polygons.
- Understand that regular polygons have the same number of lines of symmetry as they do sides.
- Understand that any straight line through the centre of a circle is a line of symmetry.
- Describe how to position or draw elements (e.g. counters or lines) in order to make a pattern or shape symmetrical.
- Organize their work, choose methods and strategies, and record findings effectively.
- Make or draw a symmetrical pattern or shape with a vertical, horizontal or diagonal line of symmetry.

## GMS Milestone 1

- Complete given symmetrical patterns, or create their own, with one vertical, horizontal or diagonal line of symmetry (GMS 4:1e)
- Use a mirror, folded paper shape or drawing, to show the lines of symmetry in 2D shapes when presented in different orientations (GMS 4:1f)
- Explain why all regular polygons have the same number of lines of symmetry as the number of sides or vertices (GMS 4:1g)

## Explorer Progress Book 4, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 2: Shape Symmetry

After completing work on Activity 2, give children Explore More Copymaster 2: Shape Symmetry (enlarged to A3) to take home.

## Pupil Book 4, pp. 54–57

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Symmetry, reflection and balance](#)
2. [Creating a symmetrical pattern with a non-vertical line of symmetry](#)
3. [Investigating lines of symmetry in triangles](#)
4. [Investigating lines of symmetry in quadrilaterals](#)
5. [Investigating lines of symmetry in regular polygons and circles](#)
6. [Completing symmetrical patterns and shapes](#)

# Numbers and the Number System 4: Introducing negative numbers

**Key mathematical ideas** Negative numbers, Ordering, Place value, Mathematical thinking and reasoning

## Educational context

In this activity group, negative numbers are introduced through contexts that are likely to be familiar to children, such as lifts, temperature and the passage of time. This will support their work on changing states and using thermometers in science and interpreting timelines in history. It is suggested that, in areas where the temperature is likely to fall below 0°C, this activity group is taught at the coldest part of the year so that children can directly connect their own experience of feeling cold to reading negative numbers on the temperature scale. Attention is given to helping children identify the use of the superscript ‘-’ symbol to show negative numbers and how this differs from subtracting situations and writing number ranges or fractions (e.g.  $-5$ ,  $7 - 5 = 2$ ,  $5 - 7$  or  $\frac{1}{2}$ ). They meet the idea of direction when finding the difference between a positive and a negative number in several contexts, including working out how many years have passed between a BCE event and the present day and finding how many degrees the temperature has risen or fallen between, e.g.  $-5^{\circ}\text{C}$  and  $14^{\circ}\text{C}$ .

## Learning opportunities

- To read, write and order negative numbers.
- To relate the magnitude of negative numbers to their position on measuring scales.
- To know that negative numbers appear to the left of 0 and positive numbers to the right of 0 on a number line.
- To distinguish contexts where negative numbers are meaningful from contexts where they are not.

## Terms for children to use

negative numbers, positive numbers, thermometer, temperature, levels, horizontal, vertical, increasing, decreasing, direction, magnitude, degrees Celsius ( $^{\circ}\text{C}$ )

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Explain that the larger the negative number, the further it is from 0.
- Read negative number notation on a vertical scale, e.g. on a thermometer using degrees Celsius ( $^{\circ}\text{C}$ ).
- Explain that the magnitude of negative numbers increases as temperature falls.
- Spot the symmetry in numbers increasing and decreasing either side of 0 on the number line.
- Compare and order negative numbers.
- Relate the negative and positive numbers on the number line to the passage of years BCE and CE.
- Explain that both direction and distance (or size) are involved when making forward and backward movements on the number line.

## NPC Milestone 3

- To count backwards through zero to include negative numbers (NPC 4:3a)
- To read, write and order positive and negative numbers within a range of  $-20$  to  $20$  (NPC 4:3b)

## Explorer Progress Book 4b, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 12: Negative Line-up

After completing work on Activity 3, give children Explore More Copymaster 12: Negative Line-up to take home.

## Pupil Book 4, pp. 58–61

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Understanding negative numbers](#)
2. [Negative numbers in the context of temperature](#)
3. [Negative number lines](#)
4. [Warmer and colder](#)
5. [Negative numbers and timelines](#)
6. [A number line game](#)

# Numbers and the Number System 5: Fractions and recognizing part-whole relationships

**Key mathematical ideas** Fractions, Equivalence, Mathematical thinking and reasoning

## Educational context

The activities in this group consolidate and build on children's earlier work with fractions in the *Number, Pattern and Calculating 3 Teaching Resource Handbook*. A wide variety of images and measuring contexts are used to provide a foundation from which children can gradually generalize about fractions as numbers and as distances along a number line. The activities encourage children to notice the relationship between the numerator and denominator to help them compare and order fractions. Children also develop previous work with calculating and prepare for connecting common fractions with their equivalent expressions in decimal fraction notation. Importantly, children begin to add and subtract fractions with a common denominator, initially within realistic contexts.

## Learning opportunities

- To explore fractions in different contexts.
- To generalize about a half, a quarter and three quarters.
- To develop understanding of fractions equivalent to a half.
- To know that, when comparing fractions with a common denominator, the larger numerator represents the larger fraction.
- To understand, when comparing unit fractions, that the larger the denominator, the smaller the parts.
- To add and subtract fractions with the same denominators.

## Terms for children to use

fraction, half, set, part, whole, equal parts, one out of two equal parts, numerator, denominator, quarter, three quarters, array, equivalent fraction, equivalent to, relationship, out of, thirds, fifths, sixths, sevenths, mixed number

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Recognize and name halves (and quarters) as equal parts of any whole.
- Explain patterns seen in relationships between fractions equivalent to a half.
- Explain that, the larger the denominator, the smaller the part.
- Illustrate and solve adding and subtracting calculations involving fractions.

## NPC Milestone 3

- To know that, when comparing fractions with a common denominator, the larger numerator represents the larger fraction (NPC 4:3c)
- To make connections between fractions of a shape or fractions of one whole and fractions of a length or of a set of objects (NPC 4:3d)

## Explorer Progress Book 4b, pp. 10–11

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 13: Fraction Finder

After completing work on Activity 2, give children Explore More Copymaster 13: Fraction Finder to take home.

## Pupil Book 4, pp. 62–65

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Generalizing about halves and quarters](#)
2. [Fractions equivalent to a half](#)
3. [Comparing fractions with different numerators and the same denominators](#)
4. [Comparing unit fractions with different denominators](#)
5. [Adding and subtracting halves and quarters](#)
6. [Adding and subtracting fractions beyond 1](#)

# Calculating 8: Developing fluency with the column method of adding

**Key mathematical ideas** Adding, Place value, Mathematical thinking and reasoning

## Educational context

This group of activities extends children's earlier introduction to the column method for adding using columns introduced in the Number, Pattern and Calculating 3 Teaching Resource Handbook, Calculating 13. Success with these activities depends on children having secure understanding of place value and secure recall of adding and subtracting facts. The column method is introduced in careful steps as it is such an important tool in children's calculating. The first examples use easier numbers where only ones are grouped into tens, moving onto those where tens are regrouped into hundreds. Teachers will need to select suitable calculations for any children needing to spend longer on these early stages, before moving on to the calculations involving grouping into tens and regrouping into hundreds and thousands.

In order that children know when to use column methods as well as how, they are encouraged to look carefully at the numbers in a calculation and decide whether it will involve regrouping, estimate the total and choose a method of calculating. It is also important to remind children that they are developing a wider repertoire of strategies, some mental and some written. To help children develop fluency, understanding and accuracy in their work with column calculations they will need opportunities to revisit, use and apply them regularly in as wide a variety of contexts as possible. We suggest regular opportunities are sought for this within other activity groups (including those in the Geometry, Measurement and Statistics 4 Teaching Resource Handbook), curriculum areas, homework and/or additional practice tasks.

## Learning opportunities

- To appreciate that larger numbers do not necessarily make a calculation more complicated.
- To appreciate that when calculations involve several steps it may be more efficient to use a column method.
- To review the numbers involved in a calculation to make reliable estimates and decide whether a column method is the most efficient.
- To appreciate that columns are added from right to left so that we can group and regroup.
- To understand that column methods show the column value of the digits involved.

## Terms for children to use

estimate, rounding, mental calculation, column calculation, column addition, total, sum, column method, column value, cross the place-value column, grouping, regrouping, carrying, zero as a placeholder, mental strategies, bridging, complements, compensating, partition, combining, missing number, accurately, refine

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Group ones to make tens, regroup tens to make hundreds and hundreds to make thousands.
- Identify from the numbers in a calculation where grouping and regrouping are needed.
- Review numbers in a calculation to make a reliable estimate.
- Review numbers in a calculation and explain whether or not a column method is the most efficient way to carry out the calculation.
- Explain that columns are added from right to left so that we can group and regroup.
- Illustrate grouping and regrouping on a hundreds, tens and ones place value frame extending to use thousands.
- Record the carrying digit in the correct column and refer to this as the given number of tens or hundreds to carry.
- Explain the quantity value of each column in column adding.

## NPC Milestone 3

- To know that columns are added from right to left (NPC 4:3h)
- To complete column calculations, recording the carrying or redistributed digit in the correct column and referring to this as the given number of tens or hundreds to carry (NPC 4:3i)

## Explorer Progress Book 4b, pp. 12–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 24: Add Up

After completing work on Activity 4, give children Explore More Copymaster 24: Add Up to take home.

## Pupil Book 4, pp. 66–69

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Knowing when to use the column method](#)
2. [Exploring grouping or regrouping in the column method](#)
3. [Adding 3- and 4-digit numbers using the column method](#)
4. [Developing fluency and accuracy with the column method](#)
5. [A context for adding three 3-digit numbers](#)
6. [Solving measuring problems involving adding](#)
7. [Exploring the column method and money](#)

# Calculating 9: Developing fluency with the column method of subtracting

**Key mathematical ideas** Subtracting, Place value, Mathematical thinking and reasoning

## Educational context

This group of activities extends children's earlier introduction to the written method for subtracting using columns in the *Number, Pattern and Calculating 3, Teaching Resource Handbook*, Calculating 14. Success with these activities depends on children having secure understanding of place value and secure recall of subtracting and adding facts. The column method for subtracting is introduced in careful steps as it is such an important tool for children's calculations. The activities begin with revising how to calculate differences when numbers are close together and then move on to developing children's understanding and fluency with the column method of subtracting redistributing tens before moving onto redistributing hundreds and then thousands.

In order that children know when to use written methods as well as *how*, they are encouraged to look carefully at the numbers involved in a calculation and decide whether exchanging and redistributing will be needed. Children also learn to use the inverse relationship between adding and subtracting to check their calculating. To help children develop fluency, understanding and accuracy in their work with column calculations they will need opportunities to revisit, use and apply them regularly in as wide a variety of contexts as possible. We suggest regular opportunities for this are sought within other activity groups (including those in the *Geometry, Measurement and Statistics 4 Teaching Resource Handbook*), curriculum areas, homework and/or additional practice tasks.

## Learning opportunities

- To appreciate larger numbers do not necessarily make a calculation more complicated.
- To appreciate that when calculations involve several steps it may be more efficient to use a written method.
- To review numbers involved in a calculation to make reliable estimates and decide whether a written method is the most efficient.

- To know that calculating the difference between two numbers can be recorded as jumps on a number line, or column subtracting.
- To know that written subtracting can be done by partitioning numbers then exchanging and redistributing.
- To appreciate that, when subtracting, they have to partition and shift tens or hundreds to the right.
- To know that using the inverse relationship between adding and subtracting is useful when checking calculations.

## Terms for children to use

estimate, mental calculation, written calculations, difference, column method, exchanging, redistributing, zero as a placeholder, bridging, partition, comparing

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Use recall of adding facts to calculate the difference between two numbers.
- Use the inverse relationship between adding and subtracting to check their calculating.
- Use money notation to write amounts of pounds and pence in columns.
- Calculate a difference using a column method of subtracting.
- Exchange 1 ten for 10 ones and redistribute them to the ones column.
- Exchange 1 hundred for 10 tens and redistribute them to the tens column.
- Identify from the numbers in a subtracting calculation where exchanging and redistributing is needed.

## NPC Milestone 3

- To review numbers involved in an adding calculation to make reliable estimates and decide whether the written column method is the most efficient (NPC 4:3g)

## Explorer Progress Book 4b, pp. 14–15

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 25: Film Times

After completing work on Activity 4, give children Explore More Copymaster 25: Film Times to take home.

## Pupil Book 4, pp. 70–73

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Knowing when to use a written method](#)
2. [Using the column method for subtracting](#)
3. [Using the column method for subtracting and redistributing hundreds and tens](#)
4. [Improving fluency with column subtracting with 3- or 4-digit numbers](#)
5. [Exploring the column method and money](#)
6. [Using subtracting methods to compare measures](#)

# Geometry 3: Investigating angles in shapes

**Key mathematical ideas** Describing parts and properties of shapes invariant under transformations, Classifying shapes, Equivalence

## Educational context

Children’s work on angles in the *Geometry, Measurement and Statistics 3 Teaching Resource Handbook* focused in particular on the connection between ‘dynamic’ and ‘static’ aspects of angle – that is, between angles as ‘amounts of turn’ and angles as fixed properties of shapes. In this activity group they use this learning as a basis for further exploring angles in shapes. They begin by exploring the different types of angles in polygons, revisiting the categories of angle they met in Geometry 1 and also encountering the idea of a ‘straight’ angle. They experience directly both static and dynamic aspects of angles as they make and change shapes so that they contain angles which are acute, right, obtuse, straight or ‘greater than straight’, which will prepare children for investigating reflex angles in detail in later years.

Children then investigate the idea of ‘regularity’ in polygons, with particular reference to the conventional requirement that a regular polygon not only has equal sides but also equal angles. They explore regularity in the different categories of triangles and quadrilaterals, and look at types of angles in regular polygons more generally.

The dynamic aspect of angles is again emphasized when children investigate triangles, manipulating side lengths to observe the effect on angle sizes. Reasoning about this leads into important generalizations about the limits of angle sizes in triangles, which children will meet more formally in later geometry work, for example on the sum of the interior angles of a triangle; allow plenty of time for discussion and experimentation.

In the final activity in the group children investigate which regular polygons will tessellate and consider whether any triangle will tessellate (it will). Again, they are challenged to reason about their findings, to explain why particular shapes tessellate; and again, this relates to ideas children will meet more formally in later work, on angles which fit around a point or add up to a full turn. Support them by encouraging them to draw on relevant ideas from other activities, in particular about straight angles, regularity in polygons and angle sizes in triangles.

## Learning opportunities

- To compare and order angles by size.
- To identify regular and irregular polygons.
- To recognize and make tessellations with regular polygons and triangles.

## Terms for children to use

polygon, side, vertex, vertices, angle, polygon names, straight angle, acute angle, right angle, obtuse angle, quarter, half, three-quarter, full turn, orientation, minimum, maximum, regular polygon, irregular polygon, tessellation, tessellate, tiling, align

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Name polygons according to the number of sides or vertices.
- Recognize and test whether angles in polygons are acute, right, obtuse, or of equal size.
- Recognize tessellations.
- Approach problems systematically.

## GMS Milestone 1

- Name polygons according to the number of sides or vertices (GMS 4:1h)
- Test, or recognize, angles in polygons, saying if they are acute, right-angled or obtuse (GMS 4:1i)

## Explorer Progress Book 4, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 3: Link Four Angles

After completing work on Activity 1, give children Explore More Copymaster 3: Link Four Angles to take home.

## Pupil Book 4, pp. 74–77

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Investigating types of angle in polygons](#)
2. [Angles in regular polygons](#)
3. [Investigating angles in a triangle](#)
4. [Investigating angles in tessellations](#)



# Numbers and the Number System 6: Introducing decimal fractions

**Key mathematical ideas** Equivalence, Fractions, Multiplying, Place value, Rounding, Mathematical thinking and reasoning

## Educational context

In this activity group, children's understanding of part-whole relationships is extended with the introduction of decimal fractions, initially in the context of intervals on measuring scales. The number line is used as the context in which children are encouraged to consider the numbers that lie between whole numbers, and to understand that tenths can be expressed as both common and decimal fractions. Place value within decimal fractions is linked with scaling up or down 10 times, and practical activities using Numicon 10-shapes on a Decimal Baseboard. Laminate support children's understanding and their ability to use decimal notation. In the concluding activities, children apply their knowledge of place value to comparing and ordering decimal fractions.

## Learning opportunities

- To understand that fractions fall between two consecutive whole numbers on the number line.
- To understand that common fractions and decimal fractions can both be used to represent the same number.
- To know that the decimal point serves to separate the whole and the fractional parts of a mixed number.
- To use knowledge of place value to connect the column value to the quantity value of decimal fractions.
- To use place value understanding to compare and order decimal fractions.
- To round decimal fractions.

## Terms for children to use

intervals, measuring scales, tenth, decimetre, decimal fraction, common fraction, whole number, in between, decimal point, rounding, place value

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Say a number that sits between two consecutive whole numbers on the number line.
- Express tenths of a whole as common fractions and decimal fractions.
- Explain that the value of a digit increases 10 times when moved one place to the left and decreases 10 times when moved one place to the right.
- Explain that the digit in the first decimal place represents the number of tenths.
- Show decimal fractions correctly using place value cards.
- Compare and order decimal fractions.
- Round decimal fractions to the nearest whole number.

## NPC Milestone 4

- To know that the decimal point serves to separate the whole numbers and the fractional part of a mixed number (NPC 4:4a)
- To express tenths as common fractions and decimal fractions (NPC 4:4b)
- To use place value understanding to compare and order decimal fractions with one decimal place (NPC 4:4c)

## Explorer Progress Book 4b, pp. 16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 14: Milk Round

After completing work on Activity 4, give children Explore More Copymaster 14: Milk Round

## Pupil Book 4, pp. 78–81

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Introducing decimals through measuring](#)
2. [Reading scales](#)
3. [Making connections with fractions on a number line](#)
4. [Introducing decimal notation](#)
5. [Representing decimal fractions with Numicon Shapes](#)
6. [Representing decimal fractions using place value cards and base-ten apparatus](#)
7. [Comparing decimal quantities](#)
8. [Ordering decimals in a list](#)
9. [Rounding decimals](#)

# Pattern and Algebra 3: Exploring 'equals' in balancing number sentences

**Key mathematical ideas** Adding, Subtracting, Multiplying, Dividing, Equivalence, Inverse, Non-computational thinking, Mathematical thinking and reasoning

## Educational context

The activities in this group explore the idea of equivalence, extending children's earlier work to introduce using different symbols to stand for different unknown numbers and the use of brackets. The activities are also designed to encourage children to look carefully at the numbers involved in a calculation and to recognize situations in which they can use non-computational strategies, e.g. adjusting and compensating, as opposed to calculating.

The activities start with revision of the use of the 'is greater than' and 'is less than' symbols to express inequalities, but in a more challenging context in which different expressions are compared. The idea of equivalence is extended. Children are encouraged to use strategies for adjusting expressions in balancing number sentences involving subtracting as well as adding, with some problems set in a money context. Balancing number sentences involving multiplying and dividing are introduced with children using number rods to explore equivalences. This work leads children carefully to an understanding of the use of brackets, which begin to be used to show the order of calculation for more complex expressions that would otherwise be ambiguous.

Finally, children explore the equivalence evident in the associative property of multiplying, i.e. when multiplying three numbers it makes no difference to the product which pair of numbers are multiplied together first.

## Learning opportunities

- To consider number relationships and the calculations involved when comparing expressions in balancing number sentences.
- To develop strategies for making calculations easier by adjusting and compensating numbers.
- To know they can use number relationships to work out missing numbers.
- To develop strategies for solving problems where more than one number is missing.

- To compare expressions in balancing number sentences involving adding, subtracting, multiplying and dividing.
- To find missing numbers in balancing number sentences involving adding, subtracting and multiplying.
- To know that brackets are used to show the order in which calculations are to be carried out.
- To know that multiplying is associative.

## Terms for children to use

expressions, relative size, greater than, less than, equal, equivalent, adjust, compensate, kilograms, compensate for the difference, totals, brackets, balancing number sentences, balancing calculations

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Use the  $<$  and  $>$  symbols to compare expressions in balancing number sentences and explain their reasoning.
- Adjust and compensate numbers in balancing number sentences without calculating.
- Explain that Numicon Shapes can be used to stand for different missing numbers.
- Explain the knowledge they have drawn on to solve missing number problems, e.g. complements, doubles, inverses.
- Explain that brackets are used to show the order in which calculations are to be carried out.
- Explain that three numbers can be multiplied together in any order and the product will be the same.

## NPC Milestone 4

- To know that three numbers can be multiplied together in any order and the product will be the same (NPC 4:4d)
- To find missing numbers in balancing number calculations involving adding, subtracting and multiplying (NPC 4:4e)
- To know that brackets are used to show the order in which calculations are carried out (NPC 4:4f)

- To develop strategies for comparing and adjusting calculations (NPC 4:4g)
- To review numbers involved in a subtracting calculation to make a reliable estimate and decide whether a written column method is the most efficient (NPC 4:4h)
- To know that using the inverse relationship between adding and subtracting is useful when checking calculations (NPC 4:4i)

## Explorer Progress Book 4b, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 4: Weightlifter

After completing work on Activity 3, give children Explore More Copymaster 4: Weightlifter to take home.

## Pupil Book 4, pp. 82–85

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Using symbols to show inequalities](#)
2. [Exploring balancing number sentences](#)
3. [Finding missing numbers in balancing number sentences](#)
4. [Solving problems where shapes stand for unknown numbers](#)
5. [Exploring equivalence in subtracting sentences](#)
6. [Using numbers rods to explore equivalence](#)
7. [Introducing recording with brackets](#)
8. [Exploring the associative property of multiplying](#)

# Calculating 10: Exploring the distributive property and developing written methods of multiplying

**Key mathematical ideas** Multiplying, Distributive property, Mathematical thinking and reasoning

## Educational context

The activities in this group lead children to understand that when they are multiplying they can make the numbers easier to work with by partitioning them, multiplying the parts and adding the products to find the total product. This distributive property of multiplying lies behind the short written method of multiplying that children were introduced to in the *Number, Pattern and Calculating 3 Teaching Resource Handbook*, Calculating 15. They revisit this method in this activity group before extending with larger numbers in Calculating 12. The activities start by looking at arrays and parts of arrays to illustrate the distributive property and move on to using known multiplying facts to work out other facts. The children will meet a range of multiplying problems in a variety of contexts including correspondence problems where  $n$  objects are connected to  $m$  objects.

To help children develop fluency, understanding and accuracy in their work with written calculations they will need opportunities to revisit, use and apply them regularly in as wide a variety of contexts as possible. We suggest regular opportunities for this are sought within other activity groups (including those in *Geometry, Measurement and Statistics 4 Teaching Resource Handbook*), curriculum areas, homework and/or additional practice tasks.

## Learning opportunities

- To recognize that using doubles facts can be an efficient strategy for solving a variety of multiplying problems.
- To know that the total number in an array can be calculated by separating the array into two or more parts, multiplying to find the product of each part and adding these products together.
- To understand that known multiplying facts can be used to work out other multiplying facts, e.g. knowing  $3 \times 5$  can help you work out  $6 \times 5$ .
- To understand the conventional short written method for multiplying.
- To write statements about the equivalence of expressions using the distributive property.

## Terms for children to use

array, commutative facts, times, multiplied by, multiplying sentences, multiplying facts, double, doubles fact, whole, parts, partition, repeated, product, total

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Read and write pairs of commutative multiplying sentences for arrays.
- Recognize doubled numbers and use doubles facts when multiplying.
- Separate arrays into two or more parts and write multiplying sentences for each part.
- Use known multiplying facts to work out other multiplying facts, e.g. use  $\times 10$  and  $\times 1$  facts to multiply by 11, use  $\times 10$  and  $\times 2$  facts to multiply by 12.
- Use apparatus to support understanding of the short written method of multiplying.
- Write equivalent expressions using the distributive property, e.g.  $17 \times 5 = 10 \times 5 + 7 \times 5$ .

## NPC Milestone 4

- To use known multiplying facts and the distributive property to derive and record other multiplying facts (NPC 4:4j)
- To use a doubling strategy and understanding of the distributive property to derive unfamiliar multiplying facts (NPC 4:4k)

## Explorer Progress Book 4b, pp. 20–23

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 22–23) where they can reflect on the mathematics they have done so far.

## Explore More Copymaster 26: Pet Shops

After completing work on Activity 2, give children Explore More Copymaster 26: Pet Shops to take home.

## Pupil Book 4, pp. 86–89

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [A doubling strategy for multiplying](#)
2. [More doubling strategies for multiplying](#)
3. [Multiplying in parts using the distributive property](#)
4. [Working out multiplying facts using the distributive property](#)
5. [Exploring the short written method of multiplying with teen numbers](#)

# Calculating 11: Using multiplying facts to solve dividing problems

**Key mathematical ideas** Dividing, Distributive property, Fractions, Mathematical thinking and reasoning

## Educational context

This activity group extends children's previous work on dividing in Calculating 6 and revisits the short written method of dividing introduced in the Number, Pattern and Calculating 3 Teaching Resource Handbook, Calculating 15. Using the language and structure of grouping in this activity group explicitly connects multiplying and dividing facts as well as providing vital practice for the short written method of dividing. The children will meet a range of dividing problems in a variety of contexts including correspondence problems. In order to help children develop fluency, understanding and accuracy with the short written method of dividing regular opportunities should be sought to review this method. The activities move on to helping children make connections between dividing and fractions, using arrays to illustrate equal parts of a whole. The final activity looks at remainders in different dividing situations to help children understand that what we do with the remainder depends on the problem.

## Learning opportunities

- To use the inverse relationship between multiplying and dividing.
- To use halving as a dividing strategy.
- To use multiplying facts and the distributive property of multiplying strategically when solving dividing problems.
- To know that having fluent recall of multiplying facts supports the short written method of dividing.
- To use multiplying and dividing facts to find fractions of amounts.
- To understand that the way a remainder is expressed depends on the contexts of the dividing problem.

## Terms for children to use

parts, divided into, inverse, multiply, dividing facts, multiplying facts, dividing strategy, dividing into, factor, half, halving, quarter, eighth, how many ... in ... ?, array, trio, fraction, remainder, multiple, grouping, sharing

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Find halves, quarters and eighths of a number or quantity.
- Record dividing facts and the inverse multiplying facts.
- Relate halving to dividing into 2.
- Use multiplying facts as a strategy when dividing.
- Complete calculations accurately using the short written method of dividing.
- Show understanding of the distributive property of multiplying when using multiplying facts as a strategy for dividing.
- Use a times table grid square and the distributive property of multiplying to derive dividing facts.
- Describe part of an array as a fraction of the whole array.
- Explain links between finding fractions and dividing.
- Explain remainders in ways that are consistent with the context of the dividing problems.

## NPC Milestone 5

- To understand that known multiplying facts and the distributive property can be used to work out dividing facts (NPC 4:5e)
- To use multiplying and dividing facts to find fractions of amounts (NPC 4:5f)
- To understand that the way a remainder is expressed depends on the context of the problem (NPC 4:5g)

## Explorer Progress Book 4c, pp. 2–3

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 27: Canoe Adventure

After completing work on Activity 2, give children Explore More Copymaster 27: Canoe Adventure to take home.

## Pupil Book 4, pp. 90–93

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [A halving strategy for dividing](#)
2. [Using a halving strategy with dividing problems in real-life contexts](#)
3. [Using multiplying facts as a strategy for dividing](#)
4. [Using the short written method of dividing](#)
5. [Finding fractions of amounts using multiplying and dividing facts](#)
6. [Working with remainders in problems](#)

# Pattern and Algebra 4: Exploring multiples and factors

**Key mathematical ideas** Adding, Subtracting, Multiplying, Dividing, Pattern, Inverse, Mathematical thinking and reasoning

## Educational context

This activity group brings together many key ideas that help children make important connections between multiples, common multiples and factors. After revising familiar multiples, the activities move on to finding common multiples and finding the lowest common multiple. Children explore a practical situation where using common multiples helps them to work efficiently, but the focus of the thinking in the activities is on investigating relationships between multiplying, dividing, number trios, inverses and sequences of multiples. The work extends to exploring multiples and factors, and children meet the word 'factor' for the first time as they use structured apparatus to find factors of different numbers.

## Learning opportunities

- To explore sequences of different multiples in the range 1–100.
- To find common multiples for two or more sequences.
- To notice that there are fewer multiples of larger numbers than there are of smaller numbers in a given range.
- To understand that the factors of a number are those numbers which will divide into it without leaving a remainder.
- To make and use connections between multiplying number trios, multiples and factors.
- To recognize and find factor pairs.

## Terms for children to use

sequence of multiples, repeating patterns, rule, generalize, common multiples, lowest common multiple, multiply, divide, inverse, number trio, factor, factor pair, commutative property

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Recognize that some multiples occur in more than one sequence.
- Explain that they have used connections between multiplying and dividing to predict how many multiples are in a sequence in the range 1–100.
- Work systematically to compare sequences of multiples and find the lowest common multiple.
- Explain that the factors of a number are the numbers that can be divided into it without leaving a remainder.
- Find factors using inverse multiplying and dividing facts.
- Use multiplying number trios to find factors and factor pairs.

## NPC Milestone 5

- To understand that the factors of a number are those numbers that can be divided into it without leaving a remainder (NPC 4:5a)
- To find pairs of factors (NPC 4:5b)
- To find common multiples for two or more sequences (NPC 4:5c)
- To make and use connections between multiplying number trios, multiples and factors (NPC 4:5d)

## Explorer Progress Book 4c, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 5: Multiple Link

After completing work on Activity 2, give children Explore More Copymaster 5: Multiple Link to take home.

## Pupil Book 4, pp. 94–97

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Finding multiples to 100](#)
2. [Exploring common multiples](#)
3. [Finding the lowest common multiple](#)
4. [Making lists of multiples to solve problems](#)
5. [Exploring multiples and factors](#)
6. [Exploring factors with apparatus](#)

# Calculating 12: Developing fluency with the short written method of multiplying

**Key mathematical ideas** Multiplying, Distributive property, Mathematical thinking and reasoning

## Educational context

This activity group builds on and extends children's previous work on multiplying and its distributive property in *Number, Pattern and Calculating 4*, *Calculating 10*. The work starts by revisiting arrays, splitting these into different parts and calculating the product of the whole array by adding the products. This imagery provides support to help children develop their understanding of the short written method of multiplying when multiplying 2- or 3- digit numbers by 1-digit numbers. The activities move on to provide opportunities for solving multiplying problems in a variety of contexts, including correspondence problems where  $n$  objects are connected to  $m$  objects and problems involving measures and money, to help children recognize situations in which they need to multiply and when they might use a written method to support this. The children will meet a range of multiplying problems in a variety of contexts.

## Learning opportunities

- To know that arrays can be split into different parts to make it easier to calculate the total product.
- To use recall of multiplying facts and the distributive property to calculate total products for arrays.
- To apply understanding of arrays to use the short written method of multiplying.
- To use knowledge of place value to partition numbers when multiplying.
- To know when to multiply in a variety of situations, including those involving measures and money.

## Terms for children to use

multiplying, array, times, lots of, multiplying sentences, short written method of multiplying, multiples, factors, rectangles, squares, written method, place value, names of units of measure and money (e.g. litre, kilogram, pound, pence), multiply, multiplied by, mass

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Derive multiplying sentences from parts of an array and add these to find the total product.
- Record balancing multiplying sentences using brackets to separate the parts being multiplied.
- Use knowledge of place value and recall of multiplying facts when partitioning and multiplying numbers.
- Describe the steps involved in the short written method of multiplying.
- Multiply to solve measure and money problems.

## NPC Milestone 5

- To apply understanding of arrays to use the short written method for multiplying calculations (NPC4:5h)

## Explorer Progress Book 4c, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 28: Tomato Trays

After completing work on Activity 3, give children Explore More Copymaster 28: Tomato Trays to take home.

## Pupil Book 4, pp. 98–101

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Multiplying in parts](#)
2. [Developing fluency with the short written method of multiplying](#)
3. [A context for multiplying  \$TO \times O\$](#)
4. [Multiplying in a measuring context introducing  \$HTO \times O\$](#)
5. [Multiplying in a money context using the short written method of multiplying](#)
6. [Developing fluency and accuracy with the short written method of multiplying](#)

# Calculating 13: Developing fluency with the short written method of dividing

**Key mathematical ideas** Dividing, Place value, Mathematical thinking and reasoning

## Educational context

These activities are crucial to children's developing understanding of dividing. Building on work from the *Number, Pattern and Calculating 2 and 3 Teaching Resource Handbooks*, these activities bring together the two key dividing structures of sharing and grouping and utilize these to deepen children's understanding of the short written method of dividing. Children will need plenty of time for discussion in these activities if they are to secure a sense of equivalence between sharing and grouping, and to become able to switch freely between understanding of both these structures as they carry out written dividing calculations. Children will also need plenty of time for discussion as they interpret the variety of dividing contexts offered, including correspondence problems. It is vital that children are not rushed through this work. To help children develop fluency, understanding and accuracy in their work with written calculations they will need opportunities to revisit, use and apply them regularly in as wide a variety of contexts as possible. We suggest regular opportunities for this are sought within other activity groups (including those in the *Geometry, Measurement and Statistics 4 Teaching Resource Handbook*), curriculum areas, homework and/or additional practice tasks.

## Learning opportunities

- To use the short written method of dividing to solve dividing problems.
- To record dividing calculations using the  $)$ — and  $\div$  symbols.
- To know how to use remainders in different dividing situations.
- To use multiplying facts to check dividing calculations.
- To know when to divide in a variety of situations, including measures and money.

## Terms for children to use

shared equally, dividing sentence, check, calculations, tables facts, multiples, factors, divisible by, remainders, divisor, exchanging, sharing, groups, partition, written method, names of units of measure and money (e.g. litre, kilogram, pound, pence)

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Record dividing calculations using the  $)$ — and  $\div$  symbols.
- Review numbers in a dividing calculation to decide whether to use a written or mental method.
- Use the short written method of dividing.
- Divide when necessary to solve measures and money problems.
- Use inverse multiplying facts to check dividing calculations.

## NPC Milestone 5

- To use the short written method for dividing (NPC 4:5i)
- To use multiplying facts to check short written dividing calculations (NPC 4:5j)

## Explorer Progress Book 4c, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 29: Summer Fun

After completing work on Activity 3, give children Explore More Copymaster 29: Summer Fun to take home.

## Pupil Book 4, pp. 102–105

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Uniting the 'sharing' and 'grouping' structures for dividing and deciding when to use a written method](#)
2. [Developing fluency with the short written method of dividing](#)
3. [Dividing in a measuring context introducing  \$HTO \div O\$](#)
4. [Dividing in a money context using the short written method of dividing](#)
5. [Developing fluency and accuracy with the short written method of dividing](#)

## Calculating 14: Solving problems involving more than one step

**Key mathematical ideas** Adding, Subtracting, Multiplying, Dividing, Mathematical thinking and reasoning

### Educational context

This activity group is a culmination of all that children have been learning throughout the Calculating strand. It also draws on their understanding of the number system and the work they have done so far on Pattern and Algebra. There are four activities, all based on the theme of preparing for a holiday, and all providing problems which are solved using two operations. The problems will challenge children to recognize the structures involved in the four operations, to decide whether to use a written or mental method, to reason logically about the steps to be taken, to organize their work, to decide how to check their calculating and to communicate their solutions. To help children develop fluency, understanding and accuracy in their work with written and mental calculations they will need opportunities to revisit, use and apply them regularly in as wide a variety of contexts as possible and where they have to make decisions for themselves about the operations they need to use and the most efficient calculation strategies.

### Learning opportunities

- To know when to use knowledge of calculating operations, strategies and methods.
- To appreciate the need to work systematically.
- To appreciate that solving problems often involves working in steps.
- To solve problems involving more than one step in context, choosing the appropriate operations.

### Terms for children to use

Any of the words and terms from the Calculating strand may be used, and particularly: step, cost, estimate, calculating, method, strategy, dividing, multiplying, adding, subtracting, first, second, third, total, more, less, double, halve, share, equal, number sentence, budget

### Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Approach problem solving confidently.
- Draw on a bank of known number facts to calculate efficiently.
- Organize their work and communicate their ideas fluently.
- Choose the operation, strategy and method appropriate to the problem.

### NPC Milestone 5

- To select appropriate calculating operations, strategies and methods in a variety of situations involving more than one step (NPC 4:5k)

### Explorer Progress Book 4c, pp. 10–11

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

### Explore More Copymaster 30: Cinema Trip

After completing work on Activity 2, give children Explore More Copymaster 30: Cinema Trip to take home.

### Pupil Book 4, pp. 106–109

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

### Focus activities

1. [Adding and finding differences](#)
2. [Adding and dividing](#)
3. [Multiplying and adding](#)
4. [Subtracting and dividing](#)



# Measurement 1: Finding times and durations, and using the 24-hour clock

**Key mathematical ideas** Duration, Equivalence, Scaling

## Educational context

In this activity group children continue and extend their work from the *Geometry, Measurement and Statistics 3 Teaching Resource Handbook* on telling the time and measuring and calculating with time, with a focus on increasing fluency and using their understanding in practical contexts.

They begin by practising their skills in telling time with 12-hour clocks, and revisiting the relationship between hours and minutes in order to work out time a given number of minutes earlier or later. They also refine their understanding of how times are written, in particular the use of a colon to indicate that the numbers are not decimal but based on the number 60 (with 60 seconds in a minute and 60 minutes in an hour).

Children are then introduced to the 24-hour clock. In addition to completing their introduction to the main conventions we use for telling time, this reinforces the link between cyclical aspects of time – its repeating 12- and 24-hour periods, for example – and its linear aspects, as illustrated by timelines.

In these activities children look at time and duration in a range of practical problem-solving contexts, including the timing of events in the school day, planning journeys and recording TV programmes. This challenges them to use their understanding flexibly, and to make use of a variety of illustrations of time and duration, including timetables, timelines and calendars.

As part of this work, children also create and interpret line graphs based on temperature readings taken over different time periods. This represents a key step in their statistics work, into representing and using ‘continuous’ data (which leads on, in later mathematics learning, to important ideas such as ‘continuous variables’ and ‘functions’). You can encourage children to begin to appreciate that there are different types of data, for example by asking questions about how temperature might vary between readings, or why we can sensibly connect individual readings with a line.

## Learning opportunities

- To read and make a timetable and timeline.
- To calculate with times and durations.
- To use and convert between different units of time, including days, hours, minutes and seconds.
- To read, write and calculate with 24-hour digital clock times.
- To convert between 12- and 24-hour clock times.

## Terms for children to use

minutes, seconds, hours, days, weeks, months, years, decades, centuries, analogue, digital, 12-hour clock, 24-hour clock, duration, period, elapse, start, finish, before, after, earlier, later, previous, subsequent, timeline, timetable, schedule, diary, appointment

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Use a timetable or timeline to solve problems involving times and durations, including journey planning.
- Recall relationships between units of time, including 60 seconds = 1 minute, 60 minutes = 1 hour, 24 hours = 1 day, and use these to calculate equivalences.
- Show a given analogue time as a digital time, and vice versa.
- Show and read a given 12-hour time as a 24-hour time, and vice versa.

## GMS Milestone 2

- Convert 12-hour clock times from digital to analogue, and vice versa (GMS 4:2a)
- Calculate times earlier or later than a given time, including when bridging an hour e.g. 37 minutes later than twenty to ten (GMS 4:2b)
- Use a digital stopwatch to measure the duration of an activity, reading the display as hours: minutes: seconds (GMS 4:2c)
- Interpret information shown on a simple timetable and use this to work out time durations (GMS4:2d)

- Draw timelines to solve problems involving times and durations (GMS 4:2e)
- Recall equivalences between units of time: seconds, minutes, hours, days, weeks, and choose appropriate conversions to solve problems (GMS 4:2f)
- Read and say 24-hour clock times, e.g. 17:00 as ‘seventeen hundred hours’ (GMS 4:2g)
- Write a given 12-hour clock time as a 24-hour clock time, and vice versa (GMS 4:2h)

## Explorer Progress Book 4, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 5: What’s on Next?

After completing work on Activity 5, give children Explore More Copymaster 5: What’s on Next? to take home.

## Pupil Book 4, pp. 110–113

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Calculating elapsed time and using a stopwatch](#)
2. [Creating a timetable](#)
3. [Showing duration and time on a timeline](#)
4. [Converting between days, hours, minutes and seconds](#)
5. [Solving problems involving time and duration](#)
6. [Introducing the 24-hour clock](#)
7. [Reading timetables and planning a journey](#)
8. [Working with time graphs](#)

# Pattern and Algebra 5: Looking for growing patterns in problem solving

**Key mathematical ideas** Generalizing, Pattern, Mathematical thinking and reasoning

## Educational context

In this activity group, children explore features of growing patterns while tackling problems in different contexts. They first experience patterns in which the numbers involved grow by a constant amount with each new term. They systematically record the sequences in table format, where the patterns can readily be seen. Children then move on to explore patterns that involve growing differences and doubling. This work is extended as they follow rules to write doubling sequences. In all these activities, when children have spotted a pattern and suggested a rule to explain it, they should be encouraged to predict the next term.

## Learning opportunities

- To recognize and deduce rules for growing patterns.
- To explore growing patterns with a range of imagery and apparatus.
- To record results systematically in a table to reveal relationships between the terms, the Numicon Shapes used to make them and the position of the terms (first, second, third, ...).
- To recognize that the value of terms in doubling patterns increases more rapidly than the value of terms in constant step sequences.
- To use strategies for finding rules, e.g. growing differences or doubling differences, for unfamiliar number sequences.

## Terms for children to use

growing pattern, first term, first stage, rule, sequence of numbers to the ... term, difference, growing difference, results table, increasing, decreasing, sequence of multiples, systematically, rectangular, doubling difference

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Follow a rule to devise a growing pattern.
- Record growing patterns systematically using adding or multiplying.
- Record results systematically in a table.
- Use multiplying and dividing facts to calculate the values of terms in growing patterns.
- Compare the results of growing patterns in a table and notice patterns and relationships between the terms, the amount of Shapes used to make them and the position of the terms (first, second, third, ...).
- Notice patterns in the terms of doubling sequences.
- Work out rules for unfamiliar number sequences and devise rules to make up their own.

## NPC Milestone 6

- To recognize and deduce rules for growing patterns including doubling sequences (NPC 4:6g)

## Explorer Progress Book 4c, pp. 12–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 6: Ladybird Lines

After completing work on Activity 3, give children Explore More Copymaster 6: Ladybird Lines to take home.

## Pupil Book 4, pp. 114–117

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Making growing pictures with Numicon Shapes](#)
2. [Exploring growing patterns in problem solving](#)
3. [Exploring growing number patterns](#)
4. [Exploring patterns with growing differences](#)
5. [Exploring doubling patterns in problems](#)
6. [Following rules to write doubling sequences](#)

# Geometry 4: Reading and plotting positions using coordinates

**Key mathematical ideas** Translation, Equivalence

## Educational context

In the Geometry, Measurement and Statistics 3 Teaching Resource Handbook, Geometry 4, children were introduced to the use of squared grids and grid references to describe position and movement in two-dimensional space. This activity group extends this to using conventional Cartesian coordinates in the first quadrant.

Children are introduced to coordinates as a way of describing and recording position with greater precision – by specifying points rather than grid squares. The conventional coordinate grid and coordinate notation are also presented in this practical context, before children move on to explore the use of the coordinate system in relation to movement, pattern, shape and symmetry. Children are introduced to the idea and term ‘translation’ (one of the four basic geometrical transformations) and to the use of coordinates to define precisely the start and end points of a translation. This opens up the possibility of defining straight lines using coordinates, and so the vertices and sides of two-dimensional shapes. Children explore how shapes can be plotted and drawn using sequences of translations described by coordinates, as well as how changes to shapes affect their coordinates, and vice versa. This work provides a valuable new way of looking at the geometrical ideas and shapes children have encountered in earlier activity groups. In addition, though, encouraging them to notice and explore patterns in coordinates – for example to note that points on the same vertical line have the same x-coordinate, or how the coordinates of symmetrical points show that the points are the same distance from the line of symmetry – enables them to take their first steps into ‘analytic’ geometry, which involves the use of algebra to study shape and space.

## Learning opportunities

- To understand that coordinates describe points on a grid – the intersection of gridlines – and not intervals or spaces.
- To understand that coordinates define a point by describing distances in two perpendicular directions.

- To use coordinates to identify and plot points in the first quadrant.
- To read and write coordinates in the conventional form  $(x,y)$ .
- To describe translations on a coordinate grid.
- To use understanding of the properties of different polygons to complete diagrams of them on a squared grid.
- To use understanding of symmetry to plot symmetrical points and draw shapes on a coordinate grid.

## Terms for children to use

grid, gridlines, grid reference, coordinate system, coordinates, point, axis, axes, x-axis, y-axis, x-direction, y-direction, origin, right, left, up, down, vertical, horizontal, perpendicular, parallel, path, route, movement, accurate, precise, repeating pattern, vertices, vertex, side, oblong, trapezium, isosceles triangle, line of symmetry, mirror line, translation

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Draw and label coordinate axes correctly.
- Identify the point where the axes cross as the origin,  $(0,0)$ .
- Identify the coordinates of a point, and say and write them with the x-coordinate first.
- Plot a point from given coordinates.
- Record a translation between points on a coordinate grid using the x- and y-coordinates.
- Describe the position of the vertices of a polygon using coordinates.
- Identify missing vertices of a given polygon shown on a coordinate grid.
- Mark a symmetrical point on a coordinate grid, given a line of symmetry and an existing point.

## GMS Milestone 3

- Label coordinate axes accurately and understand that coordinates show positions on the intersections of the gridlines (GMS 4:3a)
- Locate and plot coordinates, given as  $(x,y)$ , in the first quadrant, including coordinates that describe the vertices of a polygon (GMS 4:3b)
- Translate a counter or object on a grid, describing the movements in units, e.g. down 4, right 3 (GMS 4:3c)

## Explorer Progress Book 4, pp. 10–11

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 4: Coordinates Grid

After completing work on Activity 3, give children Explore More Copymaster 4: Coordinates Grid to take home.

## Pupil Book 4, pp. 118–121

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Identifying coordinates and plotting points on a grid](#)
2. [Describing, drawing and using movement on a coordinate grid](#)
3. [Plotting and drawing shapes on a coordinate grid](#)
4. [Symmetry and coordinates](#)

**Key mathematical ideas** Fractions, Equivalence, Order, Mathematical thinking and reasoning

## Educational context

This activity group builds on work in Numbers and the Number System 5 with activities set in a range of contexts to continue to support children towards generalizing about fractions as objects; that is, as numbers in themselves. The earlier work on equivalent fractions is now developed further to include an introduction to proportion as children investigate, in practical situations, the proportion of a whole that is represented with a fraction. Children will need plenty of time for discussion as they work through these activities and explore different contexts, including correspondence problems, to help them make essential connections with multiplying and dividing as well as with multiples and factors. These ideas are the foundations for recognizing equivalence between fractions and dividing calculations, and to simplifying fractions. Children will need plenty of time to reflect upon, discuss, and develop all of these activities.

## Learning opportunities

- To notice relationships between equivalent fractions.
- To describe relationships between equivalent fractions using proportional language.
- To make connections between factors and multiples and fractions of a whole.
- To generate equivalent fractions.
- To begin to interpret a fraction as equivalent to a dividing calculation.

## Terms for children to use

part-whole relationship, comparing, equivalent fractions, denominator, numerator, proportion, ordinal number names (e.g. third, fifth, sixth), ... for every ... , unit fraction, fraction wall, factor, equivalence, common fraction

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Explain the relationships between equivalent fractions using proportional language.
- Explain the connections between factors and multiples and fractions of a whole.
- Generate equivalent fractions.
- Interpret a fraction as equivalent to a dividing calculation

## NPC Milestone 6

- To recognize and show, using diagrams, families of common equivalent fractions (NPC 4:6b)
- To add and subtract fractions with the same denominator (NPC 4:6c)

## Explorer Progress Book 4c, pp. 14–15

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 15: Party Hats

After completing work on Activity 1, give children Explore More Copymaster 15: Party Hats to take home.

## Pupil Book 4, pp. 122–125

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Introducing the term 'proportion'](#)
2. [Using proportional language to describe equivalences](#)
3. [Making fraction walls with number rods](#)
4. [Recognizing equivalence and simplifying fractions with Numicon Shapes](#)
5. [Exploring tenths and hundredths](#)

# Numbers and the Number System 8: Introducing decimal fractions with two places

**Key mathematical ideas** Decimal fractions, Equivalence, Common fractions, Multiplying, Place value, Rounding, Mathematical thinking and reasoning

## Educational context

This further work on decimal fractions is introduced in the context of measurement, exploiting the readily made connection between scales on measuring equipment and number lines. The activities in this group draw on children's previous experiences with decimal fractions and place value, the 'scaling' structure of multiplying and part-whole relationships. Children's understanding of number relationships is expanded as they now begin to explore equivalence between decimal fractions and common fractions, and their knowledge of place value is also extended to two decimal places. Children's work in these activities involves comparing, ordering and rounding decimal fractions and writing them on empty number lines. This lays an essential foundation for calculating with decimals and leads children to encounter many challenging ideas. It is unlikely that these activities will be completed in one week, and because they are both important and challenging, further time should be given to them, to ensure children achieve understanding.

## Learning opportunities

- To make connections between the scale on a metre stick and hundredths of a metre.
- To understand the equivalence between dividing into hundredths and dividing a tenth into tenths.
- To understand that fractions with the denominator 100 are represented by two decimal places.
- To know that the decimal point separates the whole and the fractional parts in a decimal fraction.
- To understand equivalence between common fractions and decimal fractions.
- To know the decimal fraction equivalents of familiar common fractions, including  $\frac{1}{4} = 0.25$ ,  $\frac{1}{2} = 0.5$  and  $\frac{3}{4} = 0.75$ .
- To understand the size and place value relationships between ones, tenths and hundredths.
- To connect notation for amounts of money with decimal fractions and decimal notation.
- To connect digital stopwatch displays showing fractions of a second with decimal notation.
- To use understanding of place value to compare and order decimal fractions.

## Terms for children to use

tenths, hundredths, equivalence, unit of measure, interval, common fraction, decimal fraction, whole number, in between, decimal point, place value, one decimal place, two decimal places

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Find hundredths, e.g.  $\frac{25}{100}$ ,  $\frac{30}{100}$ , on a number line.
- Explain equivalence between tenths and hundredths, e.g. that  $\frac{1}{10}$  is equivalent to  $\frac{10}{100}$ .
- Explain equivalence between, e.g. 4 tenths and 3 hundredths and  $\frac{43}{100}$ .
- Explain that the value of a digit increases 10 times when moved one place to the left and decreases 10 times when moved one place to the right.
- Explain that hundredths are a hundred times smaller than one.
- Write one hundredth as  $\frac{1}{100}$  and 0.01 and explain that these are equivalent.
- Represent mixed decimal fractions, e.g. 1.23, with base-ten apparatus.
- Use decimal notation when writing amounts of money.
- Convert between money amounts in pounds and pence, e.g. £3.06 and 306p.
- Look first at the significant numbers when ordering decimal fractions.
- Partition decimal fractions.

## NPC Milestone 6

- To recognize and write decimal equivalents to  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  (NPC 4:6a)
- To recognize and write decimal equivalents of any number of tenths or hundredths (NPC 4:6d)
- To recognize that hundredths arise when dividing an object by a hundred and dividing tenths by ten (NPC 4:6e)
- To use place value understanding to compare and order decimal fractions with two decimal places (NPC 4:6f)

## Explorer Progress Book 4c, pp. 16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 16: Decimal Hundredths

After completing work on Activity 4, give children Explore More Copymaster 16: Decimal Hundredths to take home.

## Pupil Book 4, pp. 126–129

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Introducing hundredths through measuring](#)
2. [Marking hundredths on a number line](#)
3. [Using decimal notation](#)
4. [Representing decimal fractions with Numicon Shapes](#)
5. [Representing decimal fractions with two places using place value cards and base-ten apparatus](#)
6. [Decimal notation and money](#)
7. [Comparing decimal quantities](#)
8. [Ordering decimals in a list](#)

## Measurement 2: Calculating with money amounts

**Key mathematical ideas** Money, Equivalence

### Educational context

In this activity group children are encouraged to further develop their understanding of and fluency in calculating with money amounts in the practical context of a sponsored fundraising event.

The first activity makes the link between the conventional notation for money amounts and decimal fractions (this should follow on from children learning about decimals in their number work, for example in the *Number, Pattern and Calculating 4 Teaching Resource Handbook*, Numbers and the Number System 6). Here and throughout the activities children encounter the convention of reading money amounts as if they are in mixed units – for example reading £2.99 as ‘two pounds ninety-nine’ (or just ‘two ninety-nine’) – as a point of contrast with decimal fractions – 2.99 being correctly read as ‘two point nine nine’.

Children also look at the related idea of place value, and explore how understanding of place value can be used to round and adjust amounts, and so use noncomputational reasoning to quickly decide which coins or notes to pay with, or to calculate change. They then practise comparing, ordering, rounding, estimating and calculating with amounts in order to solve problems related to their sponsored event, for example to work out the total raised, or to find out how many lengths of a swimming pool (for instance) should be completed to raise a target amount. The activities are based on fictional data but could be adapted to a real-life fundraising event if the opportunity arises.

These activities also involve children in statistical work, in particular in making use of tables to collect, organize, represent and analyse data. Prompt them to think and talk about what they are doing, using ‘Why ...?’ and ‘What if ...?’ questions to encourage them to consider whether a given approach is appropriate, and how it might be improved.

### Learning opportunities

- To connect notation for amounts of money with decimal fractions and decimal notation.
- To use understanding of place value to compare and order money amounts.
- To use rounding and adjustment to estimate totals and decide how to pay.
- To calculate with money amounts.
- To create and complete a data table.

### Terms for children to use

decimal, decimal point, decimal place, place value, tenths, hundredths, equivalence, sponsor, sponsorship, sponsored, fundraising, pledge, amount, raise, rate, per, unit of measure, total, sum, range, difference, spread, data, grouped data, interval, frequency, estimate, approximate, round, rounding, nearest

### Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Use decimal notation when writing money amounts.
- Convert between money amounts in pounds and pence, e.g. £3.06 and 306p.
- Identify the significant digits when ordering money amounts.
- Partition money amounts.
- Round money amounts to the nearest pound.
- Use appropriate strategies for calculating with money amounts.
- Use estimation to check calculations.

### GMS Milestone 3

- Convert money amounts between pounds and pence, recognising that 1p is 1 hundredth of £1, e.g. 175p and £1.75 (GMS 4:3d)
- Use decimal notation to write, and say, the total value of a collection of notes and coins, e.g. write £2.46 and say ‘two pounds forty-six’ (GMS 4:3e)
- Round money amounts to the nearest pound, and give real-life examples of when this skill could be useful (GMS 4:3f)
- Present money data in a table and use this to solve problems, e.g. a sponsorship form showing how much more is needed to reach a target (GMS 4:3g)

### Explorer Progress Book 4, pp. 12–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

### Explore More Copymaster 6: Shopping

After completing work on Activity 2, give children Explore More Copymaster 6: Shopping to take home.

### Pupil Book 4, pp. 130–133

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

### Focus activities

1. [Using decimal notation for money amounts](#)
2. [Linking pounds, pence and place value and rounding to the nearest pound](#)
3. [Multiplying and adding money amounts](#)
4. [Constructing a table](#)
5. [Multiplying and adding money amounts to complete a table](#)
6. [Ordering money amounts](#)

# Measurement 3: Understanding and using units of length and distance

**Key mathematical ideas** Length, Standard units

## Educational context

In this activity group, children build on their experience of working with metres, centimetres and millimetres in the *Geometry, Measurement and Statistics 3 Teaching Resource Handbook* to further explore the units, principles and methods of length measurement in the practical context of track and field events in athletics.

They look at measurement of greater lengths – that is, ‘distances’ – and lengths which are not straight lines, and consider how a trundle wheel works. They are introduced to the use of decimal notation to record distances in metres (as 8.95 m, for example), and practise making and converting between measurements in metres, metres and centimetres, and centimetres. They are introduced to kilometres as units of distance, and to using understanding of place value and fraction and decimal equivalents to convert between metres and kilometres.

The practical activities allow children to make use of their learning, and to refine their skills and develop fluency as they measure, record, organize, present and analyse results using a variety of measurement and data-handling methods.

The activities also invite children to engage with various mathematical ideas, for example to begin to appreciate the relationship between time, distance and speed, and to explore scaling and scale factors in diagrams. In particular, though, children address the important concept of ‘continuous’ quantities. The idea of measurement accuracy is particularly relevant in competitive sport, and in discussing this with children you can encourage them to appreciate that length and time are ‘continuous’ measures: that is, any length or time measurements can only be approximate, and in theory we could go on making the measurements more accurate ‘forever’, by using smaller and smaller units.

## Learning opportunities

- To compare more than two lengths when they are recorded in different units.
- To use decimal notation for lengths in metres.
- To choose centimetres, metres or kilometres and an appropriate measuring instrument to measure length or distance.
- To understand and convert between millimetres, centimetres, metres and kilometres.
- To calculate with lengths.
- To construct an appropriate chart or graph to display data.

## Terms for children to use

kilometre, metre, centimetre, millimetre, ruler, measuring tape, distance, lap, long, longer, short, shorter, near, far, further, speed, time, revolution

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Give reasonable estimates of distance, up to about 100 m.
- Choose an appropriate instrument for measuring distance.
- Recall the number of millimetres in a centimetre, centimetres in a metre and metres in a kilometre.
- Convert between and/or compare length measurements in different metric units.
- Construct a simple bar chart independently.

## GMS Milestone 3

- Give reasonable estimates of length or distance, considering the unit and instrument most appropriate for the measurement task (GMS 4:3h)
- Use decimal notation to write, and say, lengths in m, e.g. write 3 m 85 cm as 3.85 m and say ‘three point eight five metres’ (GMS 4:3i)
- Convert lengths measurements between different metric units, knowing equivalences between mm and cm, cm and m, m and km (GMS 4:3j)
- Record length data in a table, and construct a simple bar chart to find totals and differences (GMS 4:3k)

## Explorer Progress Book 4, pp. 14–15

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 7: Throwing Challenge

After completing work on Activity 3, give children Explore More Copymaster 7: Throwing Challenge to take home.

## Pupil Book 4, pp. 134–137

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Measuring distance in whole metres](#)
2. [Measuring distance in metres using decimal notation](#)
3. [Measuring and calculating with distances](#)
4. [Recognizing equal distances](#)
5. [Presenting distance data in a bar chart](#)
6. [Introducing kilometres](#)

# Measurement 4: Understanding and using units of mass

**Key mathematical ideas** Mass and weight, Equivalence, Standard units

## Educational context

In this activity group children continue to develop their understanding of units of measurement and to expand their skills in measuring and calculating heaviness, in the problem-solving context of negotiating baggage weight rules when travelling by plane.

They begin by revisiting the relationship between grams and kilograms, using mixed units (such as 6 kg 300 g, for example) when rounding, estimating and calculating to find the total weight of belongings to be packed and to decide how these should be allocated among various bags, to avoid exceeding particular weight limits.

Children are then introduced to using digital scales to measure in kilograms, and to the use of decimal notation (6.3 kg, for example) as an alternative to mixed units. Building on their work in Measurement 2 on the use of decimal notation for money amounts, they explore place value in order to round measurements expressed as decimals to the nearest kilogram, and to identify fraction and decimal, kilogram and gram equivalents to help them work out excess baggage charges. In the final activity they have the opportunity to make use of this understanding and to further improve their fluency, in working out how to reduce weight and so avoid the excess baggage charges.

Ensure that children's understanding of the numbers and calculating involved in these activities is secure, in particular that they are comfortable with decimal fractions to two or more places and common fraction equivalents (covered in Number, Pattern and Calculating 4 Teaching Resource Handbook, Numbers and the Number System 6 and 8).

## Learning opportunities

- To use mixed units of mass, e.g. 1 kg 300 g.
- To use decimal notation for mass, e.g. 1.3 kg.
- To convert between masses in grams, kilograms and grams, and kilograms, e.g. 1300 g = 1 kg 300 g = 1.3 kg.
- To calculate with masses.
- To solve problems involving mass

## Terms for children to use

allowance, limit, restriction, excess, exceed, mass, weight, weigh, scales, grams, kilograms, convert, equivalent, equivalence, equals, place value, units, tenths, hundredths, thousandths, tens, hundreds, thousands, fraction, decimal, decimal point, decimal place, estimate, approximate, approximation, round, rounding, nearest, lighter, heavier, underweight, overweight

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Make reasonable estimates of the mass of everyday objects.
- Recall the number of grams in a kilogram.
- Use understanding of place value to partition masses.
- Round a list of masses and estimate their total.
- Use estimation to check calculations.
- Convert between grams and kilograms.
- Use appropriate strategies for calculating with masses.

## GMS Milestone 4

- Weigh items using digital scales and present results in a conversion table, e.g. 3.45 kg, 3 kg 450 g, 3450 g (GMS 4:4a)
- Round a list of masses and estimate the total, giving real-life examples of when this skill could be useful (GMS 4:4b)
- Solve problems involving mass, including finding the mass of multiples of an item and the difference between the mass and a target total (GMS 4:4c)

## Explorer Progress Book 4, pp. 16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 8: Postage Costs

After completing work on Activity 1, give children Explore More Copymaster 8: Postage Costs to take home.

## Pupil Book 4, pp. 138–141

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Calculating with mass](#)
2. [Problem solving and calculating with mass](#)
3. [Measuring mass in kilograms using decimal notation](#)
4. [Solving problems involving mass](#)



# Measurement 5: Understanding and using units of capacity and volume

**Key mathematical ideas** Capacity and volume, Equivalence, Standard units

## Educational context

This activity group involves children in solving practical problems related to capacity and volume, and uses their work on units of measurement in earlier activity groups as a basis on which to develop their understanding and confidence in calculating with measurements in litres and millilitres.

They begin by revisiting their existing knowledge of these units to calculate and measure out quantities of paint for a mural, in the process also revisiting the different but related ideas of 'volume' and 'capacity'. Decimal notation for quantities in litres is introduced in the context of mixing paint, with children establishing fraction and decimal equivalents and converting between measurements in millilitres, litres and millilitres, and litres.

They are then challenged to use this learning to help them solve problems related to the fuel tank capacity and fuel consumption of a car, a context which reinforces the conceptual distinction between volume and capacity. This also requires them to apply their understanding of the number system and the structures of the four operations to help them devise effective calculation strategies.

The numbers used in the activities can be altered to adjust the level of challenge. Support children to take a logical, reasoned approach to problem solving and to choose appropriate methods of calculation.

## Learning opportunities

- To distinguish between capacity and volume.
- To understand and use mixed units of capacity or volume,
  - e.g. 1 ℓ 500 ml.
- To use decimal notation for capacity or volume, e.g. 1.5 ℓ.
- To convert between capacities or volumes in millilitres, litres and millilitres, and litres, e.g. 1500 ml = 1 ℓ 500 ml = 1.5 ℓ.
- To solve problems about capacity or volume involving more than one step.

## Terms for children to use

capacity, volume, container, vessel, quantity, space, litre (ℓ), millilitre (ml), equivalent, equal, equate, estimate, approximate, exact, per

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Give a reasonable estimate of the capacity of a container or an everyday volume.
- Describe the difference between capacity and volume.
- Use understanding of place value to partition capacities or volumes.
- Compare and order capacities or volumes given in different metric units.
- Convert between millilitres and litres.
- Choose appropriate strategies for calculating with capacities and volumes.

## GMS Milestone 4

- Estimate the volume held within, or the capacity of, everyday containers, and describe the difference between these terms (GMS 4:4d)
- Measure out a volume of liquid, when the capacity of the jug is smaller than the total volume required, e.g. 1.5 ℓ volume using a 300 ml jug (GMS 4:4e)
- Convert between millilitres and litres e.g. 1500 ml, 1 ℓ 500 ml, 1.5 ℓ, choosing the most appropriate units to use when solving problems (GMS 4:4f)

## Explorer Progress Book 4, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 9: Fruit Punch

After completing work on Activity 2, give children Explore More Copymaster 9: Fruit Punch to take home.

## Pupil Book 4, pp. 142–145

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Calculating with litres and millilitres](#)
2. [Converting between millilitres, litres and millilitres, and litres](#)
3. [Problem solving with litres and millilitres](#)
4. [More problem solving with litres and millilitres](#)

# Pattern and Algebra 6: Solving problems and puzzles systematically

**Key mathematical ideas** Generalizing, Pattern, Mathematical thinking and reasoning

## Educational context

The activities in this group have been devised to provide children with a range of different challenges involving investigation. These practical explorations use Numicon Shapes, Pegs and Counters, and other apparatus to involve children in reasoning logically and realizing the need to work systematically in order to establish that all possibilities have been found and tested and duplicates have been eliminated. Children will also see that by working systematically they are able to spot patterns and predict from these patterns to find a general rule. An important aspect of children's work is how they communicate their ideas, and as they work on these challenges they will appreciate the need to keep an organized record of the possibilities.

## Learning opportunities

- To understand that finding all possibilities requires systematic working.
- To keep a systematic record to help with testing possibilities and proving that all possibilities have been found.
- To make and test general statements.

## Terms for children to use

possibility, combination, rotate, rules, system, systematically, systematic approach, largest/highest possible total, smallest/lowest possible total, investigate, strategies, organize, access code, eliminate

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Plan how to organize their investigation.
- Follow the same rules to investigate similar problems.
- Explain the systematic approach they have followed to find all possibilities.
- Keep systematic records of possibilities tried and tested.
- Solve problems by eliminating possibilities.

## NPC Milestone 6

- To plan how to organize an investigation and keep systematic records of possibilities tried and tested (NPC 4:6h)
- To begin to use their repertoire of number facts to predict the number of possibilities in a problem (NPC 4:6i)

## Explorer Progress Book 4c, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group.

Refer to the assessment opportunities for assistance.

## Explore More Copymaster 7: Parking Puzzle

After completing work on Activity 4, give children Explore More Copymaster 7: Parking Puzzle to take home.

## Pupil Book 4, pp. 146–149

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Working systematically to find all the possibilities](#)
2. [Finding all the possible scores](#)
3. [Finding the missing piece](#)
4. [Breaking a secret code by finding all the possibilities](#)
5. [Solving a problem by eliminating possibilities](#)

# Measurement 6: Understanding perimeter and area

**Key mathematical ideas** Length and Distance, Area, Standard units

## Educational context

In this activity group children build on their understanding of length to investigate perimeter and area, making use of a variety of practical and mathematical contexts to help illustrate the ideas involved.

They begin by consolidating their understanding of perimeter, which they met in the Geometry, Measurement and Statistics 3 Teaching Resource Handbook, by exploring methods of calculating the perimeters of different polygons. They then explore different ways of enclosing an area with the same length of fencing (that is, of making closed shapes with the same perimeter but different areas) and through this they begin to address the concept of area and its relationship to length. They measure area by counting squares, and then calculate the areas of oblongs by multiplying the lengths of adjacent sides. The final activity involves them in further exploration, reversing the conditions of their earlier investigation by asking them to find ways of making different shapes with the same area.

This work invites children to take some important steps in their mathematical thinking and learning. First, it introduces a ‘derived’ measure, with area and units of area being derived from lengths and units of length. This draws on an appreciation of ‘dimension’ and ‘dimensionality’ – area being a measure of space in two dimensions, and length in only one – which children will make more formal use of in later work on geometry and measurement. Second, their investigation into how area changes as perimeter is held constant (and vice versa) implicitly involves ideas of quantities as ‘variables’ and of relationships between variables, which again they will encounter as important concepts in later work. Ask children work on the activities in this group, encourage them to talk about what they do, see and imagine, to help them begin to form and develop these key ideas.

## Learning opportunities

- To understand that perimeter is a measure of the length or distance around the sides of a 2D shape, and that area is a measure of the size of a surface.
- To calculate the perimeter of 2D shapes.

- To find the area of 2D shapes by counting squares, and the area of rectangles by calculating.
- To understand units of area.

## Terms for children to use

length, distance, perimeter, area, size, millimetre, centimetre, metre, kilometre, square millimetre, square centimetre, square decimetre, square metre, square kilometre, polygon, regular, right angle, perpendicular, diagonal, symmetrical, side, edge, rim, boundary, limit, extent, reflection, rotation, estimate, approximate, round, equal, equivalent

## Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Devise methods of calculating perimeter according to the properties of a shape, e.g. multiplying the side length of a regular polygon by the number of sides, working out and adding side lengths of rectilinear shapes.
- Understand units of area, e.g. square metres, as a number of squares with a given side length, e.g. 1 m.
- Understand the area of an oblong in terms of an array of squares.
- Understand that shapes with the same perimeter can have different areas and vice versa.

## GMS Milestone 4

- Devise methods for calculating the perimeter of regular polygons, e.g. multiplying the side length of an equilateral triangle by 3 (GMS 4:4g)
- Draw, or use equipment to make, different polygons that have the same perimeter (GMS 4:4h)
- Use their own words to explain and show the difference between the terms perimeter and area (GMS 4:4i)
- Find the area of rectilinear shapes and shapes with diagonal sides, by counting whole squares and/or adding fractions of squares (GMS 4:4j)

## Explorer Progress Book 4, pp. 20–21

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 22–23) where they can reflect on the mathematics they have done so far.

## Explore More Copymaster 10: Help the Baker

After completing work on Activity 2, give children Explore More Copymaster 10: Help the Baker to take home.

## Pupil Book 4, pp. 150–153

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Calculating the perimeter of common polygons](#)
2. [Calculating the perimeter of composite rectilinear shapes](#)
3. [Investigating polygons with the same perimeter](#)
4. [Finding the area of 2D shapes](#)
5. [Calculating the area of an oblong](#)
6. [Investigating the perimeter of shapes with the same area](#)

# Pattern and Algebra 7: Exploring general rules, reasoning and logic

**Key mathematical ideas** Generalizing, Pattern, Mathematical thinking and reasoning

## Educational context

The activities in this group are all about solving different kinds of problems, giving children opportunities to work systematically and reason logically as they seek solutions. There are five activities in the group, each setting children a challenge that starts with action (using structured apparatus) or conversations (using statements children can relate to) to help all children join in. Some activities involve exploration in which children persevere to look for general rules. For this reason, the activities might be developed over the course of several lessons. Some activities require children to work systematically to find and record all possibilities and others require children to develop their logical reasoning. As they work, encourage children towards an understanding of the need to work systematically and to use a system of recording to support their reasoning or make general statements.

## Learning opportunities

- To know that finding a general rule involves looking for patterns and reasoning to predict what always happens.
- To know that keeping a systematic record of an investigation helps when looking for patterns and when explaining logic and reasoning.

## Terms for children to use

general rule, general statement, sequence, strategy, systematically, predict, predictions, investigate, relationships, term, step, pattern, multiple, prove, consecutive

## Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Persevere in investigating a problem.
- Notice patterns and predict from them to arrive at a general rule.
- Explain their reasoning.
- Keep systematic records.

## NPC Milestone 6

- To notice patterns and predict from them to arrive at a general rule and explain their reasoning logically (NPC 4:6j)

## Explorer Progress Book 4c, pp. 20–23

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 22–23) where they can reflect on the mathematics they have done so far.

## Explore More Copymaster 8: Cross Totals

After completing work on Activity 1, give children Explore More Copymaster 8: Cross Totals to take home.

## Pupil Book 4, pp. 154–157

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

## Focus activities

1. [Finding a general rule to total a sequence of consecutive numbers, beginning with 1](#)
2. [Finding a general rule for making crosses with number rods](#)
3. [Reasoning about odd and even multiples](#)
4. [Reasoning about general statements](#)
5. [Using clues to solve logic problems](#)

# Assessment support

The Explorer Progress Book pages will help you record and assess learning throughout the programme. Here are two additional tools to support you with assessment. Log on to your Numicon Online subscription and click on the name of the resource below to open it.

## Milestone Assessment cards

Materials for children’s self-assessment: question cards, category cards, a quick guide, milestone statements, Teaching Progression and answers. NOTE: This resource is provided as a zip file. Download, right-click and click ‘Extract’ to open the files.

The question cards are also provided on the following pages of this document.

**4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Teacher)**

Answers are in bold.

|  |  |
|--|--|
| <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">1</p> <p>In your classroom there are more than 100 of some objects. Can you think what these might be?</p> <p><b>Examples may include pens, pencils, books or paperclips.</b></p> </div> <p style="text-align: center; margin: 0;">NPC Milestone 4:1a</p> | <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">2</p> <p>A group of 11 children have a bowl of pasta each. There are 17 pieces of pasta in each bowl.</p> <p>Can you estimate how many pieces of pasta there are in total?</p> <p><b>Accept any sensible estimate between 150 and 200 pieces.</b></p> </div> <p style="text-align: center; margin: 0;">NPC Milestone 4:1a</p> |
|--|--|

## Milestone Assessment Tracking

A detailed tracking sheet for assessing your class.

| Milestone  | Code    | NPC / GM | Numicon strand | AG   | NC strand                 |
|--|---------|----------|----------------|------|---------------------------|
| <b>Number, Pattern &amp; Calculating 4 Milestone 1</b>   |         |          |                |      |                           |
| <i>By this point, children should be able to:</i>  |         |          |                |      |                           |
| • To give a sensible estimate of amounts of more than 100 objects  | NPC4:1a | NPC      | NNS            | NNS1 | Number & place value      |
| • To count aloud across multiples of 100 and multiples of 1000 to 10 000   | NPC4:1b | NPC      | NNS            | NNS2 | Number & place value      |
| • To read, write and build 4-digit numbers with apparatus and say the value of each digit                              | NPC4:1c | NPC      | NNS            | NNS1 | Number & place value      |
| • To order and compare numbers to 1000   | NPC4:1d | NPC      | NNS            | NNS2 | Number & place value      |
| • To recognize and count forwards and backwards in sequences of multiples of all numbers to 12                         | NPC4:1e | NPC      | P&A            | P&A1 | Multiplication & division |
| • To notice patterns in sequences of multiples, explain the rule for the sequence and use this to find missing numbers | NPC4:1f | NPC      | P&A            | P&A1 | Number & place value      |
| • To use the idea of constant difference to find missing numbers in sequences  | NPC4:1g | NPC      | P&A            | P&A1 | Number & place value      |
| • To know and use patterns in adding and subtracting facts for any multiple of 10                                      | NPC4:1h | NPC      | C              | C1   | Addition & subtraction    |
| • To have fluent recall of adding and subtracting facts to 10 to derive adding and subtracting facts to 100            | NPC4:1i | NPC      | C              | C1   | Addition & subtraction    |
| • To recall adding and subtracting facts to add and subtract single digit numbers to/from any number to 1000           | NPC4:1j | NPC      | C              | C2   | Addition & subtraction    |
| • To use the inverse relationship between adding and subtracting to check totals are correct                           | NPC4:1k | NPC      | C              | C1   | Addition & subtraction    |
| <b>Number, Pattern &amp; Calculating 4 Milestone 2</b>   |         |          |                |      |                           |
| <i>By this point, children should be able to:</i>  |         |          |                |      |                           |

## Milestone Assessment cards

Click on a Numicon milestone below to jump to the question cards that relate to it.

| Milestone              | Milestone statements  |         |
|------------------------|---|---------|
| <u>NPC Milestone 1</u> | To give a sensible estimate of amounts of more than 100 objects   | NPC4:1a |
|                        | To count aloud across multiples of 100 and multiples of 1000 to 10 000  | NPC4:1b |
|                        | To read, write and build 4-digit numbers with apparatus and say the value of each digit   | NPC4:1c |
|                        | To order and compare numbers to 1000  | NPC4:1d |
|                        | To recognize and count forwards and backwards in sequences of multiples of all numbers to 12  | NPC4:1e |
|                        | To notice patterns in sequences of multiples, explain the rule for the sequence and use this to find missing numbers  | NPC4:1f |
|                        | To use the idea of constant difference to find missing numbers in sequences   | NPC4:1g |
|                        | To know and use patterns in adding and subtracting facts for any multiple of 10   | NPC4:1h |
|                        | To have fluent recall of adding and subtracting facts to 10 to derive adding and subtracting facts to 100   | NPC4:1i |
|                        | To recall adding and subtracting facts to add and subtract single digit numbers to/from any number to 1000  | NPC4:1j |
|                        | To use the inverse relationship between adding and subtracting to check totals are correct  | NPC4:1k |
| <u>NPC Milestone 2</u> | To give a rounded estimate of amounts to 1000   | NPC4:2a |
|                        | To round any number to the nearest 10, 100 or 1000  | NPC4:2b |
|                        | To connect estimation and rounding numbers to the use of measuring instruments  | NPC4:2c |
|                        | To use the strategy of rounding numbers and adjusting to make calculations easier   | NPC4:2d |
|                        | To use the strategy of partitioning in different ways to simplify adding and subtracting calculations   | NPC4:2e |
|                        | To use the strategy of adding or subtracting multiples of 10 in mental calculating  | NPC4:2f |
|                        | To use compensating as a non-computational strategy for adding and subtracting  | NPC4:2g |
|                        | To know that it is important to look carefully at the numbers involved in a calculation before deciding which strategy to use   | NPC4:2h |
|                        | To recall multiplying and dividing facts for multiplication tables up to 12 x 12  | NPC4:2i |
|                        | To generalize and explain the effects of multiplying by 0 and by 1  | NPC4:2j |
|                        | To use the commutative property of multiplying and the inverse relationship between dividing and multiplying to speed up fluent recall of multiplying and dividing facts    | NPC4:2k |
| <u>NPC Milestone 3</u> | To count backwards through zero to include negative numbers   | NPC4:3a |
|                        | To read, write and order positive and negative numbers within a range of -20 to 20  | NPC4:3b |
|                        | To know that, when comparing fractions with a common denominator, the larger numerator represents the larger fraction   | NPC4:3c |
|                        | To make connections between fractions of a shape or fractions of one whole and fractions of a length or of a set of objects   | NPC4:3d |
|                        | To use inverse relationships between multiplying and dividing to record number trios and find solutions to different problems including missing number problems             | NPC4:3e |
|                        | To be able to explain how to use inverse operations to check answers to a calculation   | NPC4:3f |
|                        | To review numbers involved in an adding calculation to make reliable estimates and decide whether the written column method is the most efficient                           | NPC4:3g |
|                        | To know that columns are added from right to left   | NPC4:3h |
|                        | To complete column calculations, recording the carrying or redistributed digit in the correct column and referring to this as the given number of tens or hundreds to carry | NPC4:3i |
|                        | To explain a general rule for multiplying and dividing by 10 and 100  | NPC4:3j |

| Milestone  | Milestone statements   |  |
|--|--|--|
| <b><u>GMS Milestone 1</u></b>  | Make or draw different triangles, using properties of sides and angles to name them, e.g. scalene, right-angled                                      | GMS4:1a  |
|  | Make or draw different quadrilaterals, using properties of sides and angles to name them, e.g. oblong, trapezium, kite                               | GMS4:1b  |
|  | Explain how polygons are classified within umbrella categories, e.g. square, rectangle, parallelogram, quadrilateral, polygon                        | GMS4:1c  |
|  | Use sorting diagrams to categorize collections of shapes according to chosen criteria  | GMS4:1d  |
|  | Complete given symmetrical patterns, or create their own, with one vertical, horizontal or diagonal line of symmetry                                 | GMS4:1e  |
|  | Use a mirror, folded paper shape or drawing, to show the lines of symmetry in 2D-shapes when presented in different orientations                     | GMS4:1f  |
|  | Explain why all regular polygons have the same number of lines of symmetry as the number of sides or vertices  | GMS4:1g  |
|  | Name polygons according to the number of sides or vertices   | GMS4:1h  |
|  | Test, or recognize, angles in polygons, saying if they are acute, right-angled or obtuse   | GMS4:1i  |
| <b><u>NPC Milestone 4</u></b>  | To know that the decimal point serves to separate the whole numbers and the fractional part of a mixed number  | NPC4:4a  |
|  | To express tenths as common fractions and decimal fractions  | NPC4:4b  |
|  | To use place value understanding to compare and order decimal fractions with one decimal place   | NPC4:4c  |
|  | To know that three numbers can be multiplied together in any order and the product will be the same  | NPC4:4d  |
|  | To find missing numbers in balancing number calculations involving adding, subtracting and multiplying   | NPC4:4e  |
|  | To know that brackets are used to show the order in which calculations are carried out   | NPC4:4f  |
|  | To develop strategies for comparing and adjusting calculations   | NPC4:4g  |
|  | To review numbers involved in a subtracting calculation to make a reliable estimate and decide whether a written column method is the most efficient | NPC4:4h  |
|  | To know that using the inverse relationship between adding and subtracting is useful when checking calculations                                      | NPC4:4i  |
|  | To use known multiplying facts and the distributive property to derive and record other multiplying facts  | NPC4:4j  |
|  | To use a doubling strategy and understanding of the distributive property to derive unfamiliar multiplying facts                                     | NPC4:4k  |
|  | <b><u>NPC Milestone 5</u></b>  | To understand that the factors of a number are those numbers that can be divided into it without leaving a remainder |
| To find pairs of factors   |  | NPC4:5b  |
| To find common multiples for two or more sequences   |  | NPC4:5c  |
| To make and use connections between multiplying number trios, multiples and factors  |  | NPC4:5d  |
| To understand that known multiplying facts and the distributive property can be used to work out dividing facts              |  | NPC4:5e  |
| To use multiplying and dividing facts to find fractions of amounts   |  | NPC4:5f  |
| To understand that the way a remainder is expressed depends on the context of the problem                                    |  | NPC4:5g  |
| To apply understanding of arrays to use the short written method for multiplying calculations                                |  | NPC4:5h  |
| To use the short written method for dividing   |  | NPC4:5i  |
| To use multiplying facts to check short written dividing calculations  |  | NPC4:5j  |
| To select appropriate calculating operations, strategies and methods in a variety of situations involving more than one step |  | NPC4:5k  |

| Milestone  | Milestone statements  |  |
|--|---|--|
| <u>GMS Milestone 2</u>   | Convert 12-hour clock times from digital to analogue, and vice versa  | GMS4:2a  |
|  | Calculate times earlier or later than a given time, including when bridging an hour e.g. 37 minutes later than twenty to ten                | GMS4:2b  |
|  | Use a digital stopwatch to measure the duration of an activity, reading the display as hours: minutes: seconds                              | GMS4:2c  |
|  | Interpret information shown on a simple timetable and use this to work out time durations   | GMS4:2d  |
|  | Draw timelines to solve problems involving times and durations  | GMS4:2e  |
|  | Recall equivalences between units of time: seconds, minutes, hours, days, weeks, and choose appropriate conversions to solve problems       | GMS4:2f  |
|  | Read and say 24-hour clock times, e.g. 17:00 as “seventeen hundred hours”   | GMS4:2g  |
|  | Write a given 12-hour clock time as a 24-hour clock time, and vice versa  | GMS4:2h  |
| <u>GMS Milestone 3</u>   | Label coordinate axes accurately and understand that coordinates show positions on the intersections of the gridlines                       | GMS4:3a  |
|  | Locate and plot coordinates, given as (x,y), in the first quadrant, including coordinates that describe the vertices of a polygon           | GMS4:3b  |
|  | Translate a counter or object on a grid, describing the movements in units, e.g. down 4, right 3  | GMS4:3c  |
|  | Convert money amounts between pounds and pence, recognising that 1p is 1 hundredth of £1, e.g. 175p and £1.75                               | GMS4:3d  |
|  | Use decimal notation to write, and say, the total value of a collection of notes and coins, e.g. write £2.46 and say “two pounds forty-six” | GMS4:3e  |
|  | Round money amounts to the nearest pound, and give real-life examples of when this skill could be useful                                    | GMS4:3f  |
|  | Present money data in a table and use this to solve problems, e.g. a sponsorship form showing how much more is needed to reach a target     | GMS4:3g  |
|  | Give reasonable estimates of length or distance, considering the unit and instrument most appropriate for the measurement task              | GMS4:3h  |
|  | Use decimal notation to write, and say, lengths in m, e.g. write 3m 85cm as 3.85m and say “three point eight five metres”                   | GMS4:3i  |
|  | Convert lengths measurements between different metric units, knowing equivalences between mm and cm, cm and m, m and km                     | GMS4:3j  |
|  | Record length data in a table, and construct a simple bar chart to find totals and differences  | GMS4:3k  |
|  | <u>GMS Milestone 4</u>  | Weigh items using digital scales and present results in a conversion table, e.g. 3.45 kg, 3 kg 450 g, 3450 g |
| Round a list of masses and estimate the total, giving real-life examples of when this skill could be useful                                  |   | GMS4:4b  |
| Solve problems involving mass, including finding the mass of multiples of an item and the difference between the mass and a target total     |   | GMS4:4c  |
| Estimate the volume held within, or the capacity of, everyday containers, and describe the difference between these terms                    |   | GMS4:4d  |
| Measure out a volume of liquid, when the capacity of the jug is smaller than the total volume required, e.g. 1.5 ℓ volume using a 300 ml jug |   | GMS4:4e  |
| Convert between millilitres and litres e.g. 1500 ml, 1ℓ 500 ml, 1.5 ℓ, choosing the most appropriate units to use when solving problems      |   | GMS4:4f  |
| Devise methods for calculating the perimeter of regular polygons, e.g. multiplying the side length of an equilateral triangle by 3           |   | GMS4:4g  |
| Draw, or use equipment to make, different polygons that have the same perimeter  |   | GMS4:4h  |
| Use their own words to explain and show the difference between the terms perimeter and area  |   | GMS4:4i  |
| Find the area of rectilinear shapes and shapes with diagonal sides, by counting whole squares and/or adding fractions of squares             |   | GMS4:4j  |



| Milestone                     | Milestone statements   |         |
|-------------------------------|--|---------|
| <b><u>NPC Milestone 6</u></b> | To recognize and write decimal equivalents to $\frac{1}{2}$ , $\frac{1}{4}$ , $\frac{3}{4}$                | NPC4:6a |
|                               | To recognize and show, using diagrams, families of common equivalent fractions                             | NPC4:6b |
|                               | To add and subtract fractions with the same denominator  | NPC4:6c |
|                               | To recognize and write decimal equivalents of any number of tenths or hundredths                           | NPC4:6d |
|                               | To recognize that hundredths arise when dividing an object by a hundred and dividing tenths by ten         | NPC4:6e |
|                               | To use place value understanding to compare and order decimal fractions with two decimal places            | NPC4:6f |
|                               | To recognize and deduce rules for growing patterns including doubling sequences                            | NPC4:6g |
|                               | To plan how to organize an investigation and keep systematic records of possibilities tried and tested     | NPC4:6h |
|                               | To begin to use their repertoire of number facts to predict the number of possibilities in a problem       | NPC4:6i |
|                               | To notice patterns and predict from them to arrive at a general rule and explain their reasoning logically | NPC4:6j |

## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Pupil)

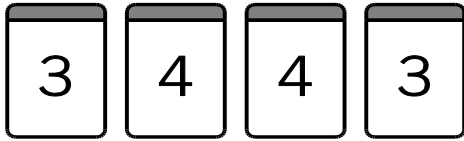
Answers are on the answer pages that follow.

|   |   |
|---|---|
| <p>1</p> <p>In your classroom there are more than 100 of some objects. Can you think what these might be?</p> | <p>2</p> <p>A group of 11 children have a bowl of pasta each. There are 17 pieces of pasta in each bowl.</p> <p>Can you estimate how many pieces of pasta there are in total?</p>   |
| NPC Milestone 4:1a  | NPC Milestone 4:1a  |
| <p>3</p> <p>Can you continue to count in steps of 20 from 280 until you reach 1000?</p>                       | <p>4</p> <p>Can you count in steps of 50 from 8950 to 10 000?</p>   |
| NPC Milestone 4:1b  | NPC Milestone 4:1b  |
| <p>5</p> <p>Can you use counters (or other apparatus) to build 3440 and then explain your model?</p>          | <p>6</p> <p>Ben chooses these number cards:</p> <p style="text-align: center;"><span style="border: 1px solid black; border-radius: 10px; padding: 5px 15px;">700</span>   <span style="border: 1px solid black; border-radius: 10px; padding: 5px 15px;">3000</span>   <span style="border: 1px solid black; border-radius: 10px; padding: 5px 15px;">6</span></p> <p>Can you show how you would record the total of the numbers on Ben's cards?</p> |
| NPC Milestone 4:1c  | NPC Milestone 4:1c  |

## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

7



Using these digits, can you make six 3-digit numbers and place them in order from largest to smallest?

NPC Milestone 4:1d

8

4 1 8 7 3

Can you use these digits with the comparison symbols  $>$  and  $<$  to compare two pairs of 3-digit numbers?

NPC Milestone 4:1d

9

Can you count back in multiples of 6 from 78 to 30?

NPC Milestone 4:1e

10

Can you describe how you would find the missing numbers in this sequence?

35, 31, 40, 36, \_\_, \_\_, \_\_, ...

NPC Milestone 4:1e

11

Look at this sequence of numbers:

14, 21, 28, 35, 42, ...

Can you explain how to work out the next three numbers in the sequence?

NPC Milestone 4:1f

12

Here is part of a sequence:

104, 112, 120, 128, ...

Can you explain whether 169 would be in this sequence?

NPC Milestone 4:1f

## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

13

Can you work out what the two previous terms are in Sam's sequence?

..., \_\_, \_\_, 63, 59, 55, 51, 47

NPC Milestone 4:1g

14

Peter has 400 ml of apple juice. He drinks 4 glasses of 75 ml each.

Can you record the number sequence for this problem?

NPC Milestone 4:1g

15

Can you fill in the blanks in the table?

|    |     |    |
|----|-----|----|
| +  | 66  |    |
| 34 |     | 80 |
|    | 110 |    |

NPC Milestone 4:1h

16

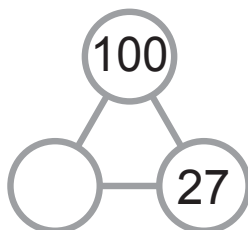
The answer is 60.

Can you write six different adding or subtracting facts using only multiples of 10?

NPC Milestone 4:1h

17

Can you find the missing number in this trio?



NPC Milestone 4:1i

18

Can you work out which numbers go in the empty boxes?

$$70 = 43 + \square$$

$$40 = \square - 28$$

$$90 = 103 - \square$$

NPC Milestone 4:1i

## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

19

Can you explain your strategy to add 9 to the following numbers?

121, 245, 394

20

Can you explain your strategy to subtract 7 from the following numbers?

189, 323, 402

NPC Milestone 4:1j

NPC Milestone 4:1j

21

Can you describe the inverse operation you would use to check these calculations?

$$348 + 122 = 470$$

$$500 - 267 = 233$$

22

Louise has calculated:

$$\begin{array}{r} 4 \quad 5 \quad 7 \\ + \quad 2 \quad 8 \quad 4 \\ \hline 7 \quad 3 \quad 1 \end{array}$$


Can you use the inverse operation to check her answer is correct?

NPC Milestone 4:1k

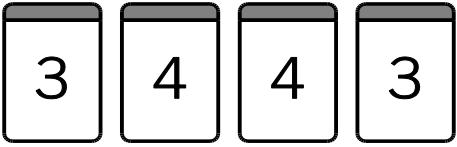
NPC Milestone 4:1k

## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Teacher)

Answers are in bold.

|   |   |
|---|---|
| <p><b>1</b></p> <p>In your classroom there are more than 100 of some objects. Can you think what these might be?</p> <p><b>Examples may include pens, pencils, books or paperclips.</b></p>   | <p><b>2</b></p> <p>A group of 11 children have a bowl of pasta each. There are 17 pieces of pasta in each bowl.</p> <p>Can you estimate how many pieces of pasta there are in total?</p> <p><b>Accept any sensible estimate between 150 and 200 pieces.</b></p>   |
| <p>NPC Milestone 4:1a</p>   | <p>NPC Milestone 4:1a</p>   |
| <p><b>3</b></p> <p>Can you continue to count in steps of 20 from 280 until you reach 1000?</p> <p><b>280, 300, 320 ... and so on</b></p>  | <p><b>4</b></p> <p>Can you count in steps of 50 from 8950 to 10 000?</p> <p><b>8950, 9000, 9050, 9100, 9150, 9200, 9250, 9300, 9350, 9400, 9450, 9500, 9550, 9600, 9650, 9700, 9750, 9800, 9850, 9900, 9950, 10 000</b></p>   |
| <p>NPC Milestone 4:1b</p>   | <p>NPC Milestone 4:1b</p>   |
| <p><b>5</b></p> <p>Can you use counters (or other apparatus) to build 3440 and then explain your model?</p>  <p><b>Example: in this model each white counter represents 1000, each light grey one represents 100 and each dark grey one represents 10.</b></p> | <p><b>6</b></p> <p>Ben chooses these number cards:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; border-radius: 10px; padding: 5px 15px; margin: 5px;">700</div> <div style="border: 1px solid black; border-radius: 10px; padding: 5px 15px; margin: 5px;">3000</div> <div style="border: 1px solid black; border-radius: 10px; padding: 5px 15px; margin: 5px;">6</div> </div> <p>Can you show how you would record the total of the numbers on Ben's cards?</p> <p><b><math>3000 + 700 + 6 = 3706</math></b></p> |
| <p>NPC Milestone 4:1c</p>   | <p>NPC Milestone 4:1c</p>   |

## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Teacher)

|  |  |
|--|--|
| <p><b>7</b></p>  <p>Using these digits, can you make six 3-digit numbers and place them in order from largest to smallest?</p> <p><b>443, 434, 433, 344, 343, 334</b></p>   | <p><b>8</b></p> <p>4 1 8 7 3</p> <p>Can you use these digits with the comparison symbols <math>&gt;</math> and <math>&lt;</math> to compare two pairs of 3-digit numbers?</p> <p><b>Examples are:</b><br/><b>418 <math>&gt;</math> 341 and 187 <math>&lt;</math> 734</b></p> |
| <p>NPC Milestone 4:1d</p>  | <p>NPC Milestone 4:1d</p>  |
| <p><b>9</b></p> <p>Can you count back in multiples of 6 from 78 to 30?</p> <p><b>78, 72, 66, 60, 54, 48, 42, 36, 30</b></p>  | <p><b>10</b></p> <p>Can you describe how you would find the missing numbers in this sequence?</p> <p>35, 31, 40, 36, __, __, __, ...</p> <p><b>Rule is <math>-4, +9</math>, so the next numbers would be 45, 41, 50.</b></p>   |
| <p>NPC Milestone 4:1e</p>  | <p>NPC Milestone 4:1e</p>  |
| <p><b>11</b></p> <p>Look at this sequence of numbers:</p> <p>14, 21, 28, 35, 42, ...</p> <p>Can you explain how to work out the next three numbers in the sequence?</p> <p><b>Rule is <math>+7</math> so the next three numbers would be 49, 56, 63.</b></p> | <p><b>12</b></p> <p>Here is part of a sequence:</p> <p>104, 112, 120, 128, ...</p> <p>Can you explain whether 169 would be in this sequence?</p> <p><b>Rule is <math>+8</math> so 169 would not be in the sequence, but 168 would be.</b></p>                                |
| <p>NPC Milestone 4:1f</p>  | <p>NPC Milestone 4:1f</p>  |

## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Teacher)

13

Can you work out what the two previous terms are in Sam's sequence?

..., \_\_, \_\_, 63, 59, 55, 51, 47

**Rule is  $-4$  so the two previous terms would be 67 and 71.**

NPC Milestone 4:1g

14

Peter has 400 ml of apple juice. He drinks 4 glasses of 75 ml each.

Can you record the number sequence for this problem?

**400 325 250 175 100**

NPC Milestone 4:1g

15

Can you fill in the blanks in the table?

|           |            |           |
|-----------|------------|-----------|
| +         | 66         | <b>46</b> |
| 34        | <b>100</b> | 80        |
| <b>44</b> | 110        | <b>90</b> |

NPC Milestone 4:1h

16

The answer is 60.

Can you write six different adding or subtracting facts using only multiples of 10?

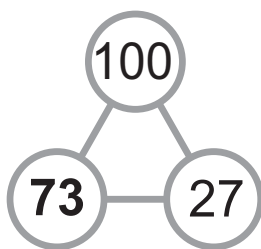
**Examples are:**

**$10 + 50$ ,  $20 + 40$ ,  $30 + 30$ ,  
 $150 - 90$ ,  $100 - 40$ ,  $70 - 10$**

NPC Milestone 4:1h

17

Can you find the missing number in this trio?



NPC Milestone 4:1i

18

Can you work out which numbers go in the empty boxes?

$$70 = 43 + \mathbf{27}$$

$$40 = \mathbf{68} - 28$$

$$90 = 103 - \mathbf{13}$$

NPC Milestone 4:1i



## 4.1 Numicon Milestone Assessment – NPC 4 Milestone 1 (Teacher)

|   |  |
|---|--|
| <p><b>19</b></p> <p>Can you explain your strategy to add 9 to the following numbers?</p> <p style="text-align: center;">121, 245, 394</p> <p><b>Strategies will involve using known bonds to 10 and bridging strategies.</b></p>  | <p><b>20</b></p> <p>Can you explain your strategy to subtract 7 from the following numbers?</p> <p style="text-align: center;">189, 323, 402</p> <p><b>Strategies will involve counting down in ones and using bridging strategies.</b></p>  |
| NPC Milestone 4:1j  | NPC Milestone 4:1j   |
| <p><b>21</b></p> <p>Can you describe the inverse operation you would use to check these calculations?</p> <p style="text-align: center;">348 + 122 = 470<br/> <b>470 – 122 = 348</b></p> <p style="text-align: center;">500 – 267 = 233<br/> <b>233 + 267 = 500</b></p> | <p><b>22</b></p> <p>Louise has calculated:</p> $  \begin{array}{r}  4 \quad 5 \quad 7 \\  + \quad 2 \quad 8 \quad 4 \\  \hline  7 \quad 3 \quad 1  \end{array}  $ <p>Can you use the inverse operation to check her answer is correct?</p> <p style="text-align: center;"><b>She is not correct.</b></p> $  \begin{array}{r}  7 \quad 3 \quad 1 \\  - \quad 2 \quad 8 \quad 4 \\  \hline  4 \quad 4 \quad 7  \end{array}  $ <p><b>Children may also check using 731 – 457 = 274.</b></p> |
| NPC Milestone 4:1k  | NPC Milestone 4:1k   |

## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

1

A football stadium's full capacity is 9893.

On Saturday they sold just over half the seats.

Can you give a rounded estimate, to the nearest 1000, of the crowd's capacity?

NPC Milestone 4:2a

2

Can you give a sensible estimate for the number of children in our primary school?

NPC Milestone 4:2a

3

The height of Ben Nevis is 1345 m.

Can you explain how to round this height to the nearest multiple of 10, 100 and 1000 and say what the height would be in each case?

NPC Milestone 4:2b

4

Can you think of six numbers that round up to or down to 1480?

NPC Milestone 4:2b

5

Selina says, "I have a piece of ribbon which measures about 70 or 80 cm."

What could Selina use to find the exact measurement?

NPC Milestone 4:2c

6

A recipe uses 200 ml of milk. I have just over half a litre of milk in the fridge. Will I have enough for my recipe?

NPC Milestone 4:2c

## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

7

Can you use rounding and adjusting to work out these calculations?  
Explain your thinking.

$$116 + 28 =$$

$$98 + 43 =$$

NPC Milestone 4:2d

8

Can you write three number sentences, which have answers that would round to 320?  
Use 3-digit numbers.

NPC Milestone 4:2d

9

$$265 + 60 =$$

Can you say the strategy you would use to solve this calculation?

NPC Milestone 4:2e

10

Can you explain how partitioning would help you to solve  $240 - 65$ ?

NPC Milestone 4:2e

11

Can you use the reordering strategy to solve this calculation?

$$50 + 80 + 30 + 20 =$$

NPC Milestone 4:2f

12

Can you use the reordering strategy to solve this calculation?

$$300 - 20 - 70 - 30 =$$

NPC Milestone 4:2f

## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

13

Can you write the balancing calculation for:

$$67 + 28 = \square + \square$$

NPC Milestone 4:2g

14

Can you write the balancing calculation for:

$$86 - 48 = 64 - \square$$

NPC Milestone 4:2g

15

Can you solve the following calculations and explain the strategy you used for each one?

$$92 - 38 =$$

$$97 - 45 =$$

$$70 - 41 =$$

NPC Milestone 4:2h

16

Armando says, "I am going to use column subtracting for these calculations. It's my favourite strategy."

$$576 - 24$$

$$748 - 238$$

Do you agree with his choice of strategy?

NPC Milestone 4:2h

17

Can you use multiplying and dividing facts to help you answer these questions?

$$8 \times 4 = \quad 7 \times 12 =$$

$$72 \div 9 = \quad 36 \div 4 =$$

NPC Milestone 4:2i

18

Can you write all the times tables facts that have the product of 24?

NPC Milestone 4:2i

## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

19

Can you make models to explain what would happen in these multiplying calculations?

$$10 \times 0 =$$

$$1 \times 3 =$$

NPC Milestone 4:2j

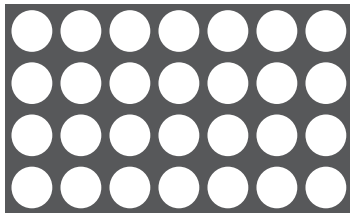
20

Can you write a sentence to explain how to multiply by 1 and 0?

NPC Milestone 4:2j

21

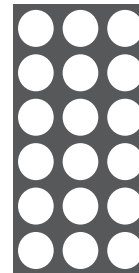
Can you write the two multiplying sentences for this array?



NPC Milestone 4:2k

22

Can you write the two dividing sentences for this array?



NPC Milestone 4:2k

## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Teacher)

|   |  |
|---|--|
| <p><b>1</b></p> <p>A football stadium's full capacity is 9893.</p> <p>On Saturday they sold just over half the seats.</p> <p>Can you give a rounded estimate, to the nearest 1000, of the crowd's capacity?</p> <p style="text-align: center;"><b>5000</b></p>  | <p><b>2</b></p> <p>Can you give a sensible estimate for the number of children in our primary school?</p> <p><b>Any sensible estimates, e.g. 200 for a one-form entry school</b></p>           |
| NPC Milestone 4:2a  | NPC Milestone 4:2a   |
| <p><b>3</b></p> <p>The height of Ben Nevis is 1345 m.</p> <p>Can you explain how to round this height to the nearest multiple of 10, 100 and 1000 and say what the height would be in each case?</p> <p><b>Nearest 10: 1350 m (5 rounds up)</b><br/> <b>Nearest 100: 1300 m (45 rounds down)</b><br/> <b>Nearest 1000: 1000 m (300 rounds down)</b></p> | <p><b>4</b></p> <p>Can you think of six numbers that round up to or down to 1480?</p> <p><b>Round down: 1481, 1482, 1483, 1484</b></p> <p><b>Round up: 1475, 1476, 1477, 1478, 1479</b></p>    |
| NPC Milestone 4:2b  | NPC Milestone 4:2b   |
| <p><b>5</b></p> <p>Selina says, "I have a piece of ribbon which measures about 70 or 80 cm."</p> <p>What could Selina use to find the exact measurement?</p> <p><b>A tape measure or metre stick</b></p>  | <p><b>6</b></p> <p>A recipe uses 200 ml of milk. I have just over half a litre of milk in the fridge. Will I have enough for my recipe?</p> <p><b>Yes, because half a litre is 500 ml.</b></p> |
| NPC Milestone 4:2c  | NPC Milestone 4:2c   |

## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Teacher)

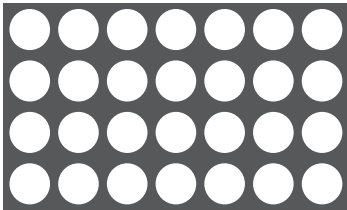
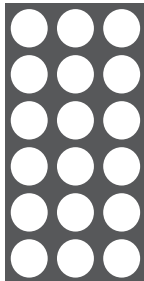
|  |  |
|--|--|
| <p><b>7</b></p> <p>Can you use rounding and adjusting to work out these calculations?<br/>Explain your thinking.</p> <p><math>116 + 28 = 144</math><br/><math>98 + 43 = 141</math></p> <p><b>Explanations may vary, e.g. Add 2 to 28 to make 30, subtract this 2 from 116 to adjust, then add <math>114 + 30 = 144</math>.</b></p> | <p><b>8</b></p> <p>Can you write three number sentences, which have answers that would round to 320?<br/>Use 3-digit numbers.</p> <p><b>Examples may include:</b></p> <p><math>121 + 197 =</math><br/><math>543 - 219 =</math></p>                   |
| NPC Milestone 4:2d   | NPC Milestone 4:2d   |
| <p><b>9</b></p> <p><math>265 + 60 =</math></p> <p>Can you say the strategy you would use to solve this calculation?</p> <p><b>A likely strategy would involve adding 35 to 265 first to make 300, then knowing there is still 25 left, adding that to make 325.</b></p>  | <p><b>10</b></p> <p>Can you explain how partitioning would help you to solve <math>240 - 65</math>?</p> <p><b>Partitioning 65 into <math>40 + 25</math> makes the subtracting easy: <math>240 - 40 = 200</math>, then subtract the 25 = 175.</b></p> |
| NPC Milestone 4:2e   | NPC Milestone 4:2e   |
| <p><b>11</b></p> <p>Can you use the reordering strategy to solve this calculation?</p> <p><math>50 + 80 + 30 + 20 =</math></p> <p><b><math>80 + 20 + 50 + 30 = 180</math></b></p>  | <p><b>12</b></p> <p>Can you use the reordering strategy to solve this calculation?</p> <p><math>300 - 20 - 70 - 30 =</math></p> <p><b><math>300 - 70 - 30 - 20 = 180</math></b></p>  |
| NPC Milestone 4:2f   | NPC Milestone 4:2f   |

## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Teacher)

|   |  |
|---|--|
| <p><b>13</b></p> <p>Can you write the balancing calculation for:</p> $67 + 28 = \square + \square$ $67 + 28 = 70 + 25$  | <p><b>14</b></p> <p>Can you write the balancing calculation for:</p> $86 - 48 = 64 - \square$ $86 - 48 = 64 - 26$  |
| <p>NPC Milestone 4:2g</p>   | <p>NPC Milestone 4:2g</p>  |
| <p><b>15</b></p> <p>Can you solve the following calculations and explain the strategy you used for each one?</p> $92 - 38 = 54$ $97 - 45 = 52$ $70 - 41 = 29$ <p><b>Children may use a variety of strategies, such as rounding and adjusting or partitioning.</b></p> | <p><b>16</b></p> <p>Armando says, “I am going to use column subtracting for these calculations. It’s my favourite strategy.”</p> $576 - 24$ $748 - 238$ <p>Do you agree with his choice of strategy?</p> <p><b>Both these examples can easily be done using mental strategies.</b></p> |
| <p>NPC Milestone 4:2h</p>   | <p>NPC Milestone 4:2h</p>  |
| <p><b>17</b></p> <p>Can you use multiplying and dividing facts to help you answer these questions?</p> $8 \times 4 = 32 \quad 7 \times 12 = 84$ $72 \div 9 = 8 \quad 36 \div 4 = 9$   | <p><b>18</b></p> <p>Can you write all the times tables facts that have the product of 24?</p> <p><b>(1 × 24), 2 × 12, 3 × 8, 4 × 6, 6 × 4, 8 × 3, 12 × 2, (24 × 1)</b></p>   |
| <p>NPC Milestone 4:2i</p>   | <p>NPC Milestone 4:2i</p>  |



## 4.2 Numicon Milestone Assessment – NPC 4 Milestone 2 (Teacher)

|  |  |
|--|--|
| <p><b>19</b></p> <p>Can you make models to explain what would happen in these multiplying calculations?</p> <p><math>10 \times 0 =</math> a model to show that multiplying a number by 0 always results in 0</p> <p><math>1 \times 3 =</math> a model to show that multiplying a number by 1 always results in the number itself</p> | <p><b>20</b></p> <p>Can you write a sentence to explain how to multiply by 1 and 0?</p> <p><b>Examples could relate to arrays, e.g. multiplying by 1 is the same as making an array with 1 row, multiplying by 0 is the same as making an array with 0 rows.</b></p>                               |
| <p>NPC Milestone 4:2j</p>  | <p>NPC Milestone 4:2j</p>  |
| <p><b>21</b></p> <p>Can you write the two multiplying sentences for this array?</p>  <p style="text-align: center;"><math>7 \times 4 = 28</math></p> <p style="text-align: center;"><math>4 \times 7 = 28</math></p>                              | <p><b>22</b></p> <p>Can you write the two dividing sentences for this array?</p>  <p style="text-align: center;"><math>18 \div 6 = 3</math></p> <p style="text-align: center;"><math>18 \div 3 = 6</math></p> |
| <p>NPC Milestone 4:2k</p>  | <p>NPC Milestone 4:2k</p>  |

### 4.3 Numicon Milestone Assessment – NPC 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

|   |   |
|---|---|
| <p>1</p> <p>Can you continue the count for 10 steps?</p> <p>3, 2, 1 ...</p>   | <p>2</p> <p>If I jumped forward 4 steps from <math>-8</math>, can you say what number I would land on?</p>  |
| NPC Milestone 4:3a  | NPC Milestone 4:3a  |
| <p>3</p> <p>Can you order the following temperatures from coldest to warmest?</p> <p>2, <math>-3</math>, 3, 7, <math>-6</math></p>  | <p>4</p> <p>Choose three pairs of numbers from this list.</p> <p><math>-7</math>, <math>-9</math>, 3, <math>-4</math>, 5, <math>-2</math></p> <p>Can you use the <math>&lt;</math> and <math>&gt;</math> symbols to compare the pairs of numbers?</p> |
| NPC Milestone 4:3b  | NPC Milestone 4:3b  |
| <p>5</p> <p>Use a Numicon 6-shape as your denominator. Can you use three Numicon Shapes to show a fraction that is</p> <p>a) less than a half<br/>b) a half<br/>c) greater than a half?</p> | <p>6</p> <p>Can you explain how you know which fraction represents the biggest portion of a chocolate bar?</p> <p><math>\frac{5}{8}</math>   <math>\frac{3}{8}</math>   <math>\frac{6}{8}</math></p>  |
| NPC Milestone 4:3c  | NPC Milestone 4:3c  |

### 4.3 Numicon Milestone Assessment – NPC 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

7

Can you show me  $\frac{1}{3}$

- a) of a 2D shape
- b) of 15 counters
- c) on an empty number line?

NPC Milestone 4:3d

8

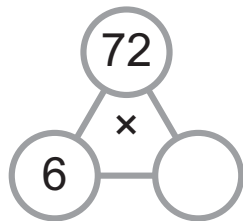
Omar says, "To find one fifth of a piece of string you cut it into 5 parts."

Can you say whether or not you agree with Omar and explain why?

NPC Milestone 4:3d

9

Can you fill in the blank on this multiplying trio?



NPC Milestone 4:3e

10

Can you fill in the empty boxes to make the calculations correct?

$$90 \square 2 = 180$$

$$180 \square 2 = 90$$

$$180 \div 20 = \square$$

NPC Milestone 4:3e

11

Can you explain how  $86 - 18 = 68$  could help you to solve this calculation?

$$68 + \square = 86$$

NPC Milestone 4:3f

12

Tom is finding subtracting difficult. Can you check if his calculations are correct, using the inverse operation?

$$100 - 56 = 54$$

$$267 - 49 = 208$$

NPC Milestone 4:3f

### 4.3 Numicon Milestone Assessment – NPC 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

13

Can you choose an efficient method to solve this calculation, and explain your method?

$$228 + 186 =$$

NPC Milestone 4:3g

14

Can you make a reliable estimate for the total of these three amounts?

$$£12.99 + £4.85 + £6.42$$

NPC Milestone 4:3g

15

Can you solve this calculation?

$$\begin{array}{r} 3 \quad 4 \quad 8 \quad 5 \\ + \quad \quad 2 \quad 6 \quad 8 \\ \hline \hline \end{array}$$

NPC Milestone 4:3h

16

Can you explain how to answer this calculation?

$$\begin{array}{r} 7 \quad 8 \quad 2 \\ + 1 \quad 6 \quad 7 \\ \hline \hline \end{array}$$

NPC Milestone 4:3h

17

Can you explain to Katy why her calculation is incorrect?

$$\begin{array}{r} 6 \quad 3 \quad 4 \\ + 3 \quad 8 \quad 3 \\ \hline 9 \quad 1 \quad 1 \quad 7 \end{array}$$

NPC Milestone 4:3i

18

Can you solve this question using column subtracting?

$$423 - 156$$

NPC Milestone 4:3i

### 4.3 Numicon Milestone Assessment – NPC 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

19

Can you explain the general rule for multiplying by 10 and 100?

NPC Milestone 4:3j

20

Can you use the rule for  $\div 100$  to turn pence into pounds?

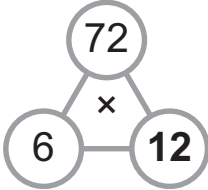
1600p =

NPC Milestone 4:3j

### 4.3 Numicon Milestone Assessment – NPC 4 Milestone 3 (Teacher)

|   |  |
|---|--|
| <p><b>1</b></p> <p>Can you continue the count for 10 steps?</p> <p style="text-align: center;">3, 2, 1 ...</p> <p style="text-align: center;"><b>0, -1, -2, -3, -4, -5, -6, -7, -8, -9</b></p>  | <p><b>2</b></p> <p>If I jumped forward 4 steps from -8, can you say what number I would land on?</p> <p style="text-align: center;"><b>-4</b></p>  |
| NPC Milestone 4:3a  | NPC Milestone 4:3a   |
| <p><b>3</b></p> <p>Can you order the following temperatures from coldest to warmest?</p> <p style="text-align: center;">2, -3, 3, 7, -6</p> <p style="text-align: center;"><b>-6, -3, 2, 3, 7</b></p>   | <p><b>4</b></p> <p>Choose three pairs of numbers from this list.</p> <p style="text-align: center;">-7, -9, 3, -4, 5, -2</p> <p>Can you use the &lt; and &gt; symbols to compare the pairs of numbers?</p> <p><b>Examples could include: -7 &gt; -9, 3 &gt; -4, -2 &lt; 5</b></p>  |
| NPC Milestone 4:3b  | NPC Milestone 4:3b   |
| <p><b>5</b></p> <p>Use a Numicon 6-shape as your denominator. Can you use three Numicon Shapes to show a fraction that is</p> <p>a) less than a half<br/>b) a half<br/>c) greater than a half?</p> <p><b>Many possible answers, e.g. using the 6-shape to show <math>\frac{2}{6}</math>, <math>\frac{3}{6}</math> and <math>\frac{4}{6}</math>.</b></p> | <p><b>6</b></p> <p>Can you explain how you know which fraction represents the biggest portion of a chocolate bar?</p> <p style="text-align: center;"><math>\frac{5}{8}</math> <math>\frac{3}{8}</math> <math>\frac{6}{8}</math></p> <p style="text-align: center;"><math>\frac{6}{8}</math></p> <p><b>As the denominators are all the same, the largest fraction will be the one with the largest numerator.</b></p> |
| NPC Milestone 4:3c  | NPC Milestone 4:3c   |

### 4.3 Numicon Milestone Assessment – NPC 4 Milestone 3 (Teacher)

|  |   |
|--|---|
| <p><b>7</b></p> <p>Can you show me <math>\frac{1}{3}</math></p> <p>a) of a 2D shape</p> <p>b) of 15 counters</p> <p>c) on an empty number line?</p> <p><b>Various representations are possible. Use your professional judgement to determine whether the child is accurate with this question.</b></p> | <p><b>8</b></p> <p>Omar says, “To find one fifth of a piece of string you cut it into 5 parts.”</p> <p>Can you say whether or not you agree with Omar and explain why?</p> <p><b>As long as the parts are equal then Omar is correct. The key is that the 5 parts must all be the same size.</b></p>  |
| <p>NPC Milestone 4:3d</p>  | <p>NPC Milestone 4:3d</p>   |
| <p><b>9</b></p> <p>Can you fill in the blank on this multiplying trio?</p> <div style="text-align: center;">  </div>  | <p><b>10</b></p> <p>Can you fill in the empty boxes to make the calculations correct?</p> <p style="text-align: center;"><math>90 \times 2 = 180</math></p> <p style="text-align: center;"><math>180 \div 2 = 90</math></p> <p style="text-align: center;"><math>180 \div 20 = 9</math></p>   |
| <p>NPC Milestone 4:3e</p>  | <p>NPC Milestone 4:3e</p>   |
| <p><b>11</b></p> <p>Can you explain how <math>86 - 18 = 68</math> could help you to solve this calculation?</p> <p style="text-align: center;"><math>68 + \square = 86</math></p> <p><b>It is an inverse calculation, so the missing number is 18.</b></p>   | <p><b>12</b></p> <p>Tom is finding subtracting difficult. Can you check if his calculations are correct, using the inverse operation?</p> <p style="text-align: center;"><math>100 - 56 = 54</math></p> <p style="text-align: center;"><b><math>54 + 56 = 110</math> (incorrect)</b></p> <p style="text-align: center;"><math>267 - 49 = 208</math></p> <p style="text-align: center;"><b><math>208 + 49 = 257</math> (incorrect)</b></p> |
| <p>NPC Milestone 4:3f</p>  | <p>NPC Milestone 4:3f</p>   |





### 4.3 Numicon Milestone Assessment – NPC 4 Milestone 3 (Teacher)

|   |  |
|---|--|
| <p><b>17</b></p> <p>Can you explain to Katy why her calculation is incorrect?</p> $  \begin{array}{r}  634 \\  + 383 \\  \hline  9117  \end{array}  $ <p><b>She has written 11 in the hundreds and tens column, rather than exchanging the ten 10s for one 100 and adding to the hundreds. The answer should be 1017.</b></p> | <p><b>18</b></p> <p>Can you solve this question using column subtracting?</p> $423 - 156$ $  \begin{array}{r}  \overset{3}{\cancel{4}} \quad \overset{11}{\cancel{2}} \quad \overset{1}{3} \\  - 1 \quad 5 \quad 6 \\  \hline  2 \quad 6 \quad 7  \end{array}  $ |
| NPC Milestone 4:3i  | NPC Milestone 4:3i   |
| <p><b>19</b></p> <p>Can you explain the general rule for multiplying by 10 and 100?</p> <p><b>Multiplying by 10: all digits move one place to the left.</b></p> <p><b>Multiplying by 100: all digits move two places to the left.</b></p>   | <p><b>20</b></p> <p>Can you use the rule for <math>\div 100</math> to turn pence into pounds?</p> $1600\text{p} = \text{£}16$  |
| NPC Milestone 4:3j  | NPC Milestone 4:3j   |

## 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

|  |   |
|--|---|
| <p>1</p> <p>Can you draw two different types of right-angled triangle and say which properties are the same and which are different?</p> | <p>2</p> <p>Can you make an equilateral triangle using geo strips?<br/>Can you describe which properties make it an equilateral triangle?</p> |
| <p>GMS Milestone 4:1a</p>  | <p>GMS Milestone 4:1a</p>   |
| <p>3</p> <p>Can you make a parallelogram using geo strips? Can you describe which properties make it a parallelogram?</p>                | <p>4</p> <p>Can you draw two different types of quadrilateral and say which properties are the same and which are different?</p>              |
| <p>GMS Milestone 4:1b</p>  | <p>GMS Milestone 4:1b</p>   |
| <p>5</p> <p>Can you name two properties of rectangles and parallelograms that are the same?</p>  | <p>6</p> <p>Can you say which properties a rhombus shares with a square?</p>  |
| <p>GMS Milestone 4:1c</p>  | <p>GMS Milestone 4:1c</p>   |

# 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Pupil)

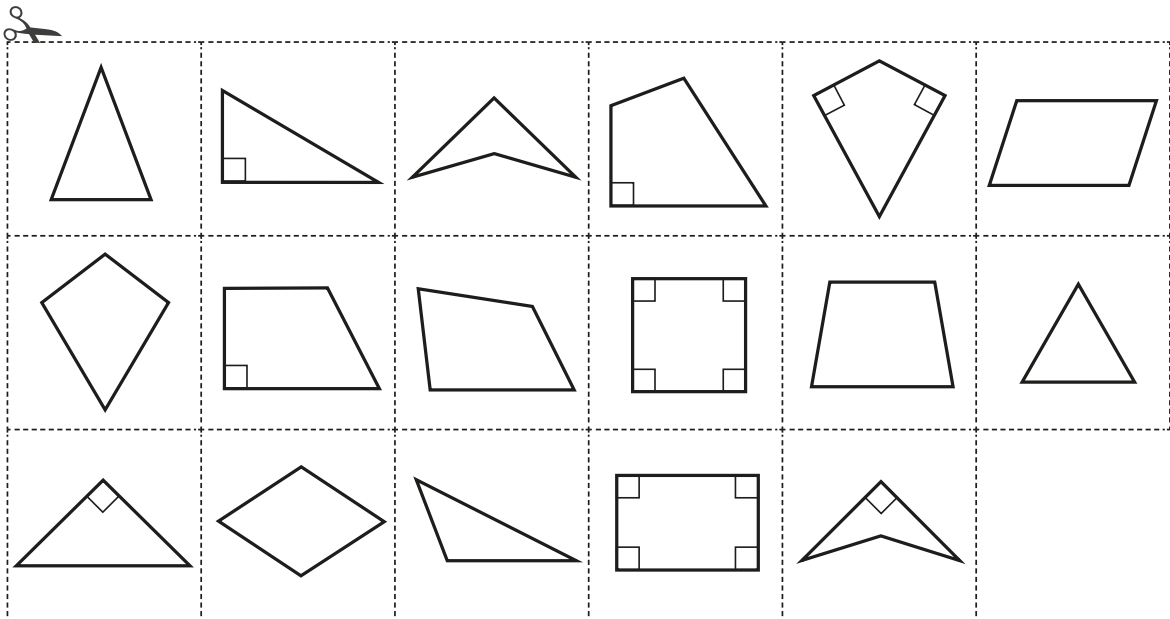
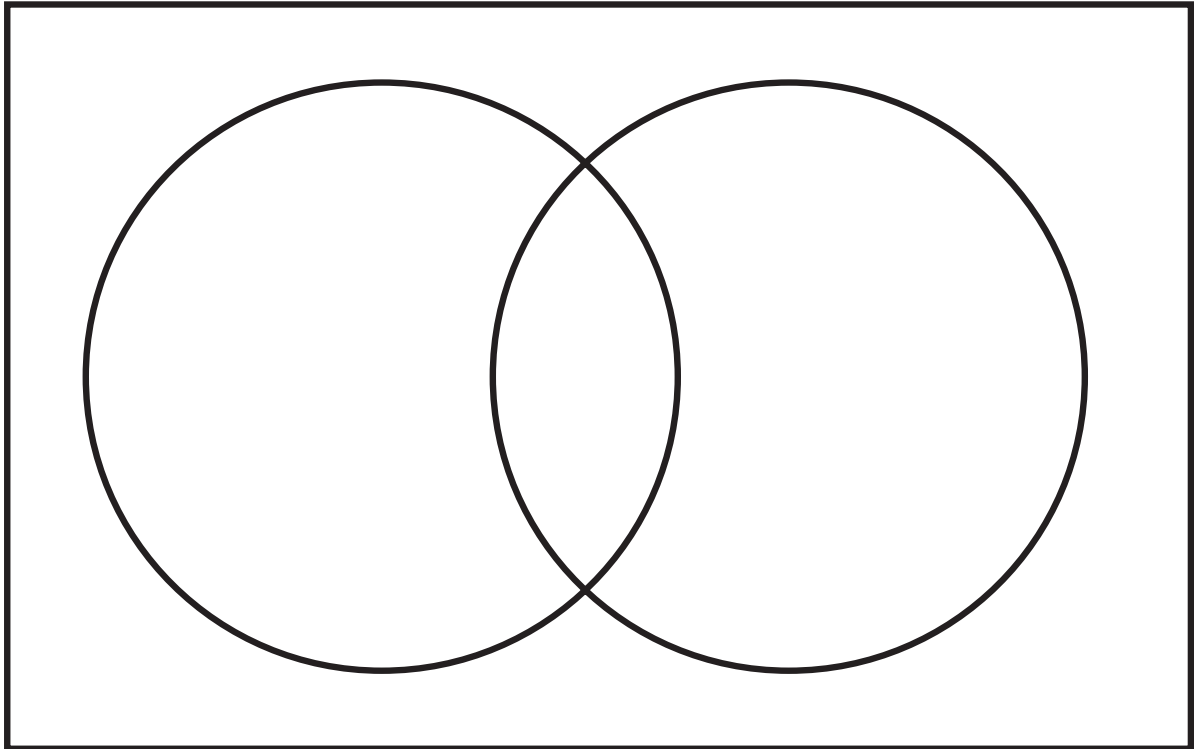
Answers are on the answer pages that follow.

7

Can you choose your own criteria to sort the collection of triangles and quadrilaterals below into a Venn diagram?

You must make sure you have shapes in each of the four regions.

Can you find alternative criteria to re-sort the shapes?



GMS Milestone 4:1d

## 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

8

Can you cover a baseboard using Numicon Shapes of your choice, so that you have a diagonal line of symmetry?

GMS Milestone 4:1e

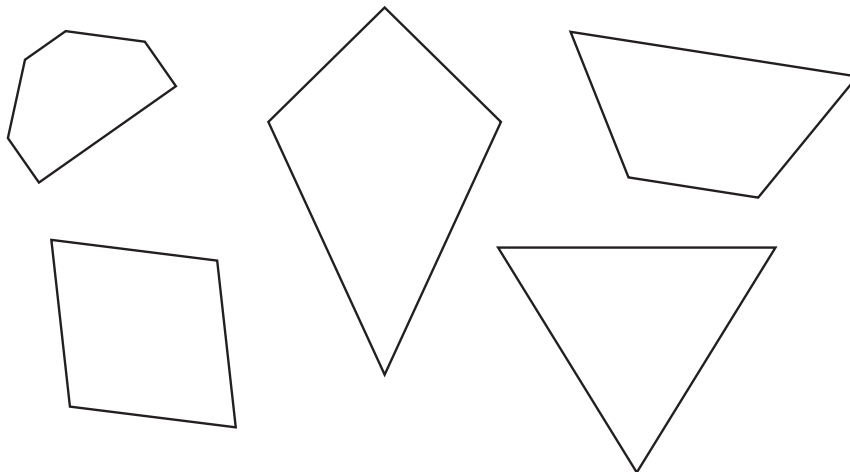
9

Can you make a symmetrical pattern with a vertical line of symmetry, using at least three different types of pattern blocks?

GMS Milestone 4:1e

10

Can you draw all the lines of symmetry on each of these 2D shapes?



GMS Milestone 4:1f

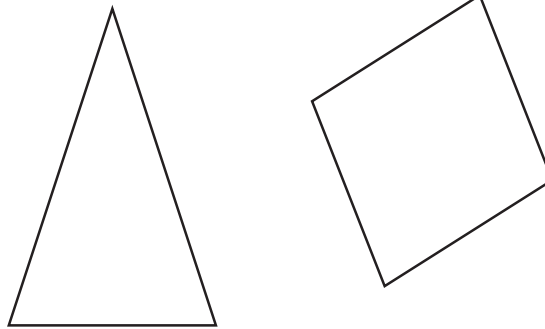
## 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

11

Trace these shapes onto a piece of paper and cut them out.

Can you fold each of the shapes to show the lines of symmetry?



GMS Milestone 4:1f

12

Visualise a regular pentagon.  
Can you identify how many lines of symmetry it has?  
Can you explain your thinking?

GMS Milestone 4:1g

13

Can you say what the relationship is between the number of lines of symmetry and the number of sides or vertices in regular polygons?

GMS Milestone 4:1g

## 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

14

Can you name the type of polygon that has 7 vertices?

15

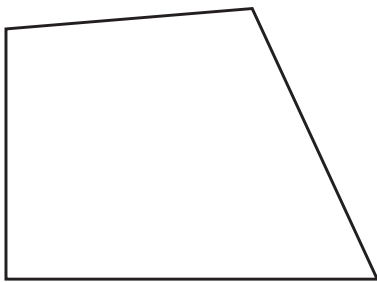
Can you describe what is special about a regular dodecagon?

GMS Milestone 4:1h

GMS Milestone 4:1h

16

Can you identify the types of angles in this polygon?



17

Can you use geo strips to make a polygon that has at least one obtuse angle, one acute angle and one right angle?

GMS Milestone 4:1i

GMS Milestone 4:1i

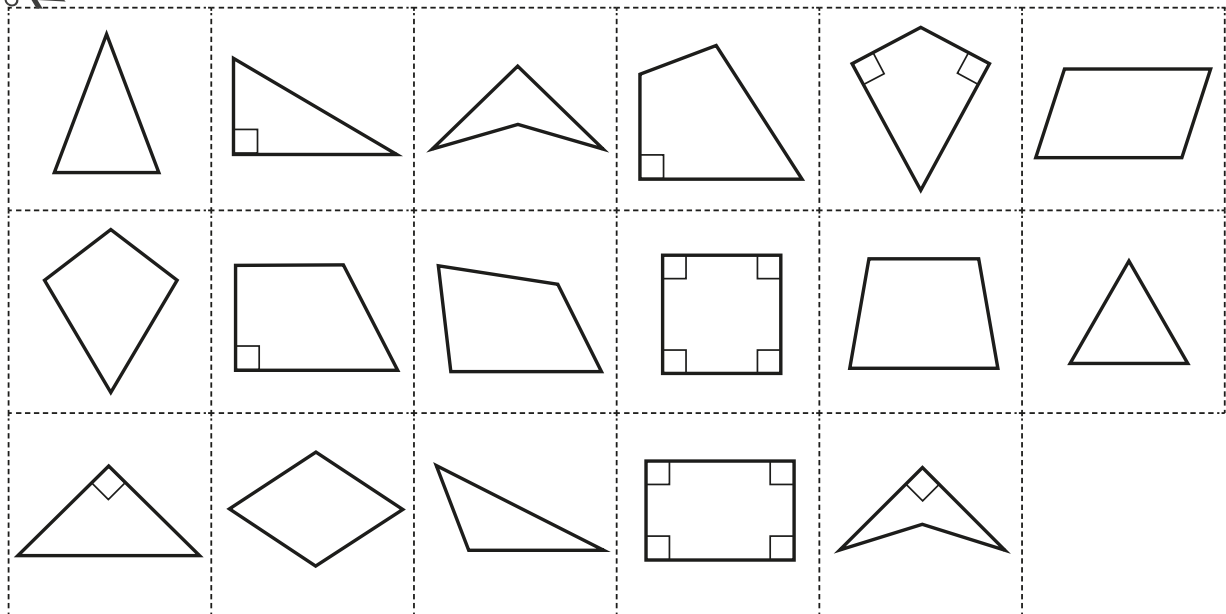
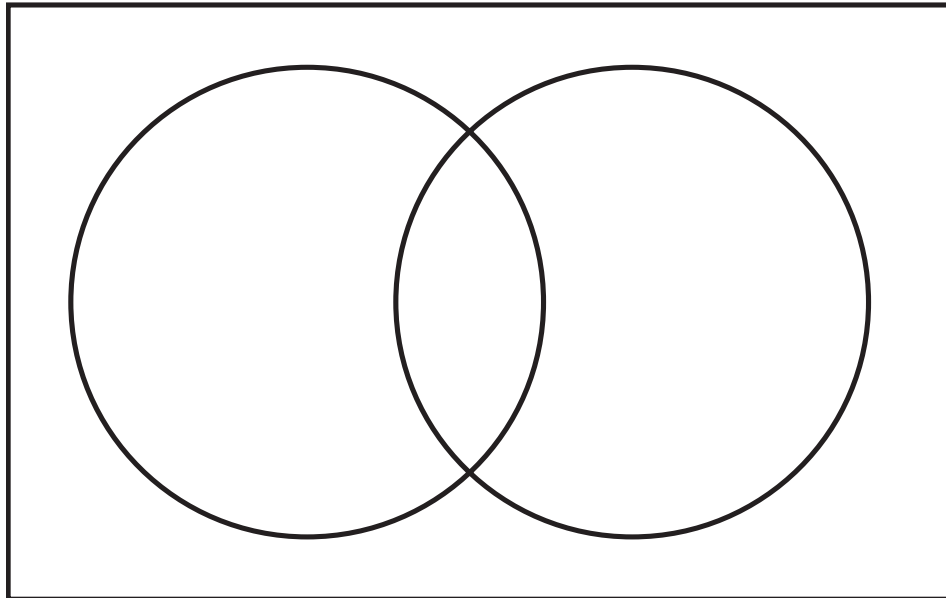
## 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Teacher)

|   |   |
|---|---|
| <p><b>1</b></p> <p>Can you draw two different types of right-angled triangle and say which properties are the same and which are different?</p> <p><b>Examples could include a right-angled isosceles triangle and a right-angled scalene triangle.</b></p> | <p><b>2</b></p> <p>Can you make an equilateral triangle using geo strips?<br/>Can you describe which properties make it an equilateral triangle?</p> <p><b>All sides must be the same length; all angles must be 60 degrees.</b></p>  |
| GMS Milestone 4:1a  | GMS Milestone 4:1a  |
| <p><b>3</b></p> <p>Can you make a parallelogram using geo strips? Can you describe which properties make it a parallelogram?</p> <p><b>Two pairs of equal, parallel sides, two pairs of opposite equal angles.</b></p>                                      | <p><b>4</b></p> <p>Can you draw two different types of quadrilateral and say which properties are the same and which are different?</p> <p><b>Various drawings are possible. Use your professional judgement to determine whether the child is accurate with this question.</b></p> |
| GMS Milestone 4:1b  | GMS Milestone 4:1b  |
| <p><b>5</b></p> <p>Can you name two properties of rectangles and parallelograms that are the same?</p> <p><b>Two pairs of equal, parallel sides, two pairs of opposite equal angles.</b></p>  | <p><b>6</b></p> <p>Can you say which properties a rhombus shares with a square?</p> <p><b>Four equal sides, pairs of opposite angles are equal.</b></p>   |
| GMS Milestone 4:1c  | GMS Milestone 4:1c  |

## 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Teacher)

7

Can you choose your own criteria to sort the collection of triangles and quadrilaterals below into a Venn diagram?  
 You must make sure you have shapes in each of the four regions.  
 Can you find alternative criteria to re-sort the shapes?



Various sorting criteria are possible, but are likely to include 'Right angle' as a category for one of the circles. Check that the shapes in the overlapping section fit into both categories to help determine whether the child's answer is accurate.

GMS Milestone 4:1d



## 4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Teacher)

8

Can you cover a baseboard using Numicon Shapes of your choice, so that you have a diagonal line of symmetry?

**Answers will vary. Check the baseboard for symmetry in the design.**

GMS Milestone 4:1e

9

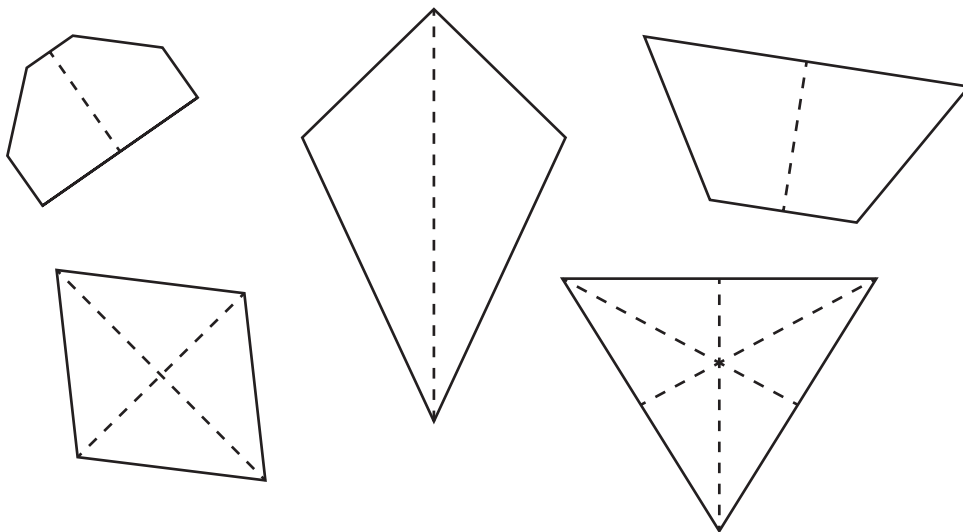
Can you make a symmetrical pattern with a vertical line of symmetry, using at least three different types of pattern blocks?

**Answers will vary. Check the pattern blocks for symmetry in the design.**

GMS Milestone 4:1e

10

Can you draw all the lines of symmetry on each of these 2D shapes?

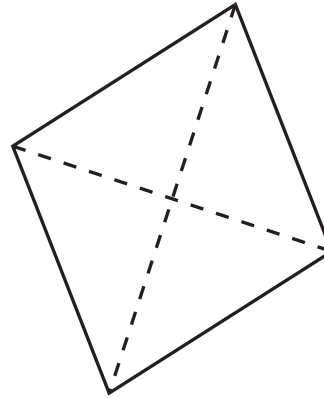
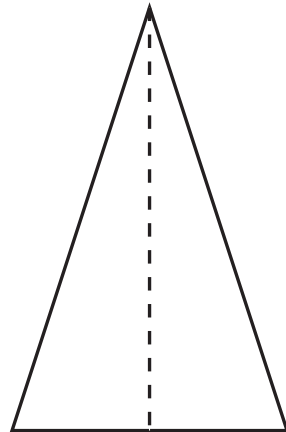


GMS Milestone 4:1f

11

Trace these shapes onto a piece of paper and cut them out.

Can you fold each of the shapes to show the lines of symmetry?



GMS Milestone 4:1f

12

Visualise a regular pentagon.  
Can you identify how many lines of symmetry it has?  
Can you explain your thinking?

**Five lines of symmetry;**  
**each one starting at a vertex and**  
**cutting an opposite side in half.**

GMS Milestone 4:1g

13

Can you say what the relationship is between the number of lines of symmetry and the number of sides or vertices in regular polygons?

**The number of lines of symmetry is equal to the number of sides and also to the number of vertices.**

GMS Milestone 4:1g

**4.1 Numicon Milestone Assessment – GMS 4 Milestone 1 (Teacher)**

**14**

Can you name the type of polygon that has 7 vertices?

**Heptagon**

**15**

Can you describe what is special about a regular dodecagon?

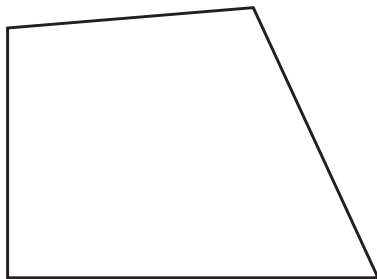
**It has 12 equal sides, 12 equal angles and 12 lines of symmetry.**

GMS Milestone 4:1h

GMS Milestone 4:1h

**16**

Can you identify the types of angles in this polygon?



**Right angle, acute angle and two obtuse angles**

**17**

Can you use geo strips to make a polygon that has at least one obtuse angle, one acute angle and one right angle?

**Various shapes could be made with a different number of sides. Use your professional judgement to determine whether the child is accurate with this question.**

GMS Milestone 4:1i

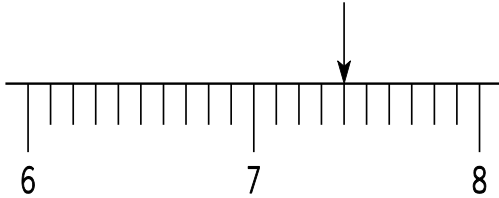
GMS Milestone 4:1i

## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

1

Can you write, in words, the value that the arrow is pointing at?



2

Can you say this number aloud?

27.7

NPC Milestone 4:4a

NPC Milestone 4:4a

3

Can you say how many whole metres and how many tenths of a metre are in 10.4 m?

4

Can you write  $3\frac{7}{10}$  kg as a decimal fraction?

NPC Milestone 4:4b

NPC Milestone 4:4b

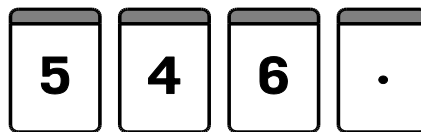
5

Can you use the  $<$  and  $>$  symbols to complete these number sentences?

$$4.5 \square 5.4$$

$$23.2 \square 23.3 \square 22.3$$

6



Using these digits, can you make 6 decimal fractions and order them from smallest to largest?

NPC Milestone 4:4c

NPC Milestone 4:4c

## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

7

Can you explain how to find the product of

$$2 \times 7 \times 6?$$

8

Which of these statements is true? Can you use the example below to help you explain?

- Three numbers can be multiplied in any order.
- You must multiply numbers in the order they are given.

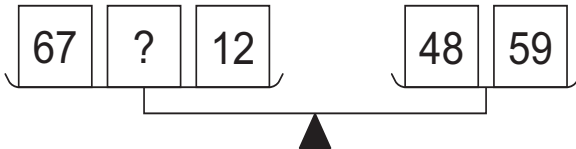
$$2 \times 5 \times 11$$

$$11 \times 5 \times 2$$

NPC Milestone 4:4d

NPC Milestone 4:4d

9



Can you write the missing number?  
Explain your strategy.

10

Can you complete this balancing number sentence?

$$7 \times \square = 19 + 9$$

NPC Milestone 4:4e

NPC Milestone 4:4e

## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

11

Can you solve this?

$$(4 \times 6) + (7 \times 3) =$$

12

Marianne has solved this question.

Can you say whether or not you agree with her answer?

$$8 + (7 \times 4) = 60$$

NPC Milestone 4:4f

NPC Milestone 4:4f

13

Can you solve this?

$$62 + 43 = \square + 39$$

14

Can you explain how to answer this adjusting number sentence?

$$64 - \square = 66 - 18$$

NPC Milestone 4:4g

NPC Milestone 4:4g

15

$$483 - 39 =$$

Can you explain the method you would use to solve this calculation?

16

$$326 - 175 =$$

Can you finish this sentence?

A reliable estimate for the calculation above is ...

NPC Milestone 4:4h

NPC Milestone 4:4h

## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

17

Can you check this calculation using the inverse operation?

$$\begin{array}{r} 487 \\ + 268 \\ \hline 755 \\ \hline 1 \quad 1 \end{array}$$

NPC Milestone 4:4i

18

Can you check this calculation using the inverse operation?

$$\begin{array}{r} 71 \\ 783 \\ - 358 \\ \hline 425 \\ \hline \end{array}$$

NPC Milestone 4:4i

19

Can you use the distributive property of multiplying to solve this calculation in two different ways?

$$7 \times 14 =$$

NPC Milestone 4:4j

20

$$6 \times 7 = 42$$

Can you derive five other facts from this multiplying fact?

NPC Milestone 4:4j

21

Can you explain how you would use a doubling strategy to solve  $32 \times 4$ ?

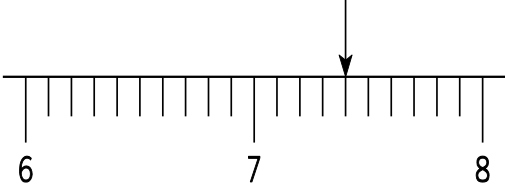
NPC Milestone 4:4k

22

Can you explain how you would solve  $17 \times 20$ ?

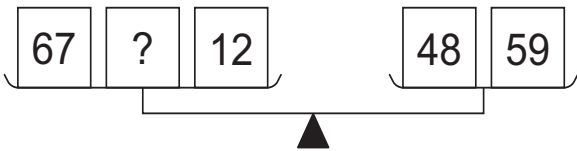
NPC Milestone 4:4k

## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Teacher)

|   |   |
|---|---|
| <p><b>1</b></p> <p>Can you write, in words, the value that the arrow is pointing at?</p>  <p><b>Seven point four (7·4)</b></p> | <p><b>2</b></p> <p>Can you say this number aloud?</p> <p style="text-align: center;">27·7</p> <p style="text-align: center;"><b>Twenty-seven point seven</b></p>  |
| NPC Milestone 4:4a  | NPC Milestone 4:4a  |
| <p><b>3</b></p> <p>Can you say how many whole metres and how many tenths of a metre are in 10·4 m?</p> <p><b>10 whole metres and 4 tenths of a metre</b></p>  | <p><b>4</b></p> <p>Can you write <math>3\frac{7}{10}</math> kg as a decimal fraction?</p> <p style="text-align: center;"><b>3·7</b></p>   |
| NPC Milestone 4:4b  | NPC Milestone 4:4b  |
| <p><b>5</b></p> <p>Can you use the &lt; and &gt; symbols to complete these number sentences?</p> <p style="text-align: center;">4·5 &lt; 5·4</p> <p style="text-align: center;">23·2 &lt; 23·3 &gt; 22·3</p>    | <p><b>6</b></p> <div style="display: flex; justify-content: center; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40px; text-align: center;"><b>5</b></div> <div style="border: 1px solid black; padding: 5px; width: 40px; text-align: center;"><b>4</b></div> <div style="border: 1px solid black; padding: 5px; width: 40px; text-align: center;"><b>6</b></div> <div style="border: 1px solid black; padding: 5px; width: 40px; text-align: center;">·</div> </div> <p>Using these digits, can you make 6 decimal fractions and order them from smallest to largest?</p> <p><b>Example:</b><br/>4·56, 4·65, 5·46, 5·64, 6·45, 6·54</p> |
| NPC Milestone 4:4c  | NPC Milestone 4:4c  |



## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Teacher)

|   |  |
|---|--|
| <p><b>7</b></p> <p>Can you explain how to find the product of</p> $2 \times 7 \times 6?$ <p><b>Rearrange to make the calculation easier:</b></p> $7 \times 6 \times 2 = 84$   | <p><b>8</b></p> <p>Which of these statements is true? Can you use the example below to help you explain?</p> <ul style="list-style-type: none"> <li>• <b>Three numbers can be multiplied in any order.</b></li> <li>• You must multiply numbers in the order they are given.</li> </ul> $2 \times 5 \times 11$ $11 \times 5 \times 2$ <p><b>Each statement equals 110. Multiplying together in any order gives the same product.</b></p> |
| <p>NPC Milestone 4:4d</p>   | <p>NPC Milestone 4:4d</p>  |
| <p><b>9</b></p>  <p>Can you write the missing number? Explain your strategy.</p> <p><b>28</b></p> <p><b>The two sides need to balance.</b></p> | <p><b>10</b></p> <p>Can you complete this balancing number sentence?</p> $7 \times 4 = 19 + 9$   |
| <p>NPC Milestone 4:4e</p>   | <p>NPC Milestone 4:4e</p>  |

## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Teacher)

|  |   |
|--|---|
| <p>11</p> <p>Can you solve this?</p> $(4 \times 6) + (7 \times 3) = 45$  | <p>12</p> <p>Marianne has solved this question. Can you say whether or not you agree with her answer?</p> $8 + (7 \times 4) = 60$ <p><b>No, brackets need to be worked out first, so the correct answer is 36.</b></p>        |
| <p>NPC Milestone 4:4f</p>  | <p>NPC Milestone 4:4f</p>   |
| <p>13</p> <p>Can you solve this?</p> $62 + 43 = 66 + 39$   | <p>14</p> <p>Can you explain how to answer this adjusting number sentence?</p> $64 - 16 = 66 - 18$ <p><b>2 has been added to 64 to make 66, so 2 needs to be subtracted from 18 to make the number sentences balance.</b></p> |
| <p>NPC Milestone 4:4g</p>  | <p>NPC Milestone 4:4g</p>   |
| <p>15</p> $483 - 39 =$ <p>Can you explain the method you would use to solve this calculation?</p> <p><b>Subtract 40 then adjust by adding 1 (444).</b></p> | <p>16</p> $326 - 175 =$ <p>Can you finish this sentence?</p> <p>A reliable estimate for the calculation above is <b>150</b>.</p>  |
| <p>NPC Milestone 4:4h</p>  | <p>NPC Milestone 4:4h</p>   |

## 4.4 Numicon Milestone Assessment – NPC 4 Milestone 4 (Teacher)

|   |  |
|---|--|
| <p><b>17</b></p> <p>Can you check this calculation using the inverse operation?</p> $\begin{array}{r} 487 \\ + 268 \\ \hline 755 \\ \hline 1 \quad 1 \end{array}$ <p><b>755 – 268 = 487</b><br/>(calculation is correct)</p>  | <p><b>18</b></p> <p>Can you check this calculation using the inverse operation?</p> $\begin{array}{r} 7 \quad 1 \\ 7 \quad \cancel{8} \quad 3 \\ - 3 \quad 5 \quad 8 \\ \hline 4 \quad 2 \quad 5 \end{array}$ <p><b>425 + 358 = 783</b><br/>(calculation is correct)</p>   |
| <p>NPC Milestone 4:4i</p>   | <p>NPC Milestone 4:4i</p>  |
| <p><b>19</b></p> <p>Can you use the distributive property of multiplying to solve this calculation in two different ways?</p> $7 \times 14 =$ <p><b>For example,</b><br/><b><math>(7 \times 10) + (7 \times 4) = 98</math></b><br/><b><math>(7 \times 7) + (7 \times 7) = 98</math></b></p> | <p><b>20</b></p> $6 \times 7 = 42$ <p>Can you derive five other facts from this multiplying fact?</p> <p><b>Various answers, e.g.</b><br/><b><math>7 \times 6 = 42,</math></b><br/><b><math>42 \div 6 = 7,</math></b><br/><b><math>42 \div 7 = 6,</math></b><br/><b><math>70 \times 60 = 420,</math></b><br/><b><math>420 \div 70 = 6</math></b></p> |
| <p>NPC Milestone 4:4j</p>   | <p>NPC Milestone 4:4j</p>  |
| <p><b>21</b></p> <p>Can you explain how you would use a doubling strategy to solve <math>32 \times 4</math>?</p> $32 \times 4 = 64 \times 2 = 128$  | <p><b>22</b></p> <p>Can you explain how you would solve <math>17 \times 20</math>?</p> $17 \times 10 = 170 \times 2 = 340$   |
| <p>NPC Milestone 4:4k</p>   | <p>NPC Milestone 4:4k</p>  |

## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

1

Can you finish this sentence to give a definition for a factor?

A factor is ...

2

Can you say which of these numbers are factors of 24?

3, 7, 1, 4, 8, 9

NPC Milestone 4:5a

NPC Milestone 4:5a

3

Can you make a model using Numicon Shapes or number rods to show the factors of 18?

4

Can you list all the pairs of factors for 36?

NPC Milestone 4:5b

NPC Milestone 4:5b

5

Can you use number rods to investigate common multiples of 3, 6 and 9? Can you find the three smallest multiples?

6

Can you complete this sentence?

Four numbers greater than 50 that are multiples of 3 and 4 are . . .

NPC Milestone 4:5c

NPC Milestone 4:5c

## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

7

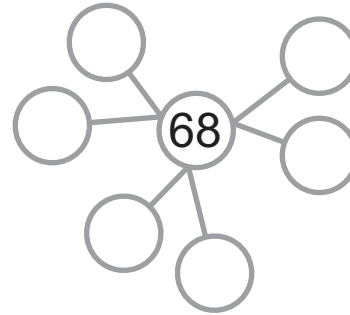
$$7 \times 8 = 56$$

Can you write other number trios using 56?

NPC Milestone 4:5d

8

Can you complete the factor diagram?



NPC Milestone 4:5d

9

$$1 \times 13 = 13$$

$$2 \times 13 = 26$$

$$4 \times 13 = 52$$

$$8 \times 13 = 104$$

Can you explain how these facts would help you to find  $65 \div 13$ ?

NPC Milestone 4:5e

10

Can you explain how you would solve:

$$80 \div 5 =$$

NPC Milestone 4:5e

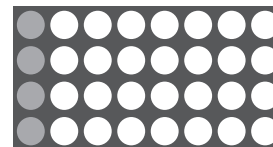
11

Can you make an array model, using two colours of counters, to show  $\frac{1}{5}$  of 15?

NPC Milestone 4:5f

12

Can you say what fraction of the counters is grey?



NPC Milestone 4:5f

## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

13

A farmer has 70 eggs that she needs to put into egg boxes. Each box will hold 6 eggs.  
Can you work out how many boxes she needs for all the eggs?

NPC Milestone 4:5g

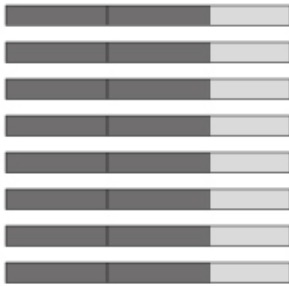
14

Can you explain how to share 74p equally between 3 friends?  
How much will each friend receive?

NPC Milestone 4:5g

15

Can you solve the calculation for this array of 10-rods and 8-rods?



NPC Milestone 4:5h

16

Can you check Charlie's calculation?

$$\begin{array}{r} 246 \\ \times \quad 4 \\ \hline 974 \\ \hline 11 \end{array}$$

NPC Milestone 4:5h

17

Can you use a short dividing calculation to answer this calculation?

$$144 \div 9 =$$

NPC Milestone 4:5i

18

Six children can sit around a table.  
Can you work out how many tables will be needed for exactly 136 children to sit?

NPC Milestone 4:5i

## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

19

Kwame calculates:

$$236 \div 4 = 59$$

Can you check this calculation using a short multiplying calculation?

NPC Milestone 4:5j

20

Ava bought some books which cost £10.50 each. She spent £63.00.

Can you calculate the number of books she bought and then check your answer using a short multiplying calculation?

NPC Milestone 4:5j

21

Can you work out what numbers could go in the empty boxes?

$$96 \div 4 = \square \div 4 + \square \div 4$$

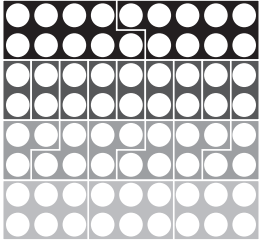
NPC Milestone 4:5k

22

Black ballpoint pens cost £1.62 each. How many can Kiara buy for £10.00?

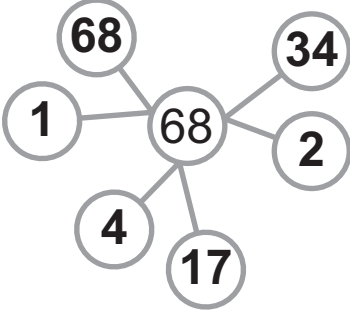
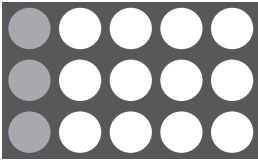
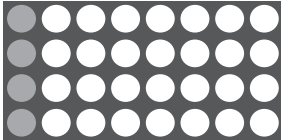
NPC Milestone 4:5k

## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Teacher)

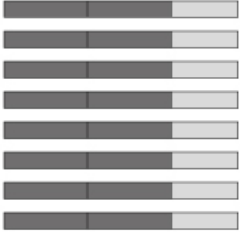
|  |   |
|--|---|
| <p><b>1</b></p> <p>Can you finish this sentence to give a definition for a factor?</p> <p>A factor is <b>a whole number that divides exactly into another number.</b></p>                      | <p><b>2</b></p> <p>Can you say which of these numbers are factors of 24?</p> <p><b>3, 7, 1, 4, 8, 9</b></p>   |
| <p>NPC Milestone 4:5a</p>  | <p>NPC Milestone 4:5a</p>   |
| <p><b>3</b></p> <p>Can you make a model using Numicon Shapes or number rods to show the factors of 18?</p>  | <p><b>4</b></p> <p>Can you list all the pairs of factors for 36?</p> <p><b>1 and 36<br/>2 and 18<br/>3 and 12<br/>4 and 9<br/>6 and 6</b></p>                 |
| <p>NPC Milestone 4:5b</p>  | <p>NPC Milestone 4:5b</p>   |
| <p><b>5</b></p> <p>Can you use number rods to investigate common multiples of 3, 6 and 9? Can you find the three smallest multiples?</p> <p><b>18, 36, 54</b></p>                              | <p><b>6</b></p> <p>Can you complete this sentence?</p> <p>Four numbers greater than 50 that are multiples of 3 and 4 are</p> <p><b>60, 72, 84 and 96.</b></p> |
| <p>NPC Milestone 4:5c</p>  | <p>NPC Milestone 4:5c</p>   |



## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Teacher)

|   |  |
|---|--|
| <p><b>7</b></p> <p><math>7 \times 8 = 56</math></p> <p>Can you write other number trios using 56?</p> <p><math>1 \times 56 = 56</math>; <math>2 \times 28 = 56</math>;<br/> <math>4 \times 14 = 56</math>; <math>8 \times 7 = 56</math>;<br/> <math>14 \times 4 = 56</math>; <math>28 \times 2 = 56</math></p>  | <p><b>8</b></p> <p>Can you complete the factor diagram?</p>    |
| <p>NPC Milestone 4:5d</p>   | <p>NPC Milestone 4:5d</p>  |
| <p><b>9</b></p> <p><math>1 \times 13 = 13</math><br/> <math>2 \times 13 = 26</math><br/> <math>4 \times 13 = 52</math><br/> <math>8 \times 13 = 104</math></p> <p>Can you explain how these facts would help you to find <math>65 \div 13</math>?</p> <p><b>The multiplying facts for 1 and 4 total 65 so then use the inverse to find <math>65 \div 13 = 5</math>.</b></p> | <p><b>10</b></p> <p>Can you explain how you would solve:</p> <p><math>80 \div 5 =</math></p> <p><b>Possible strategies include partitioning: <math>50 \div 5 + 30 \div 5</math>; <math>80 \div 10</math> then double = 16 or <math>40 \div 5</math> then double = 16</b></p> |
| <p>NPC Milestone 4:5e</p>   | <p>NPC Milestone 4:5e</p>  |
| <p><b>11</b></p> <p>Can you make an array model, using two colours of counters, to show <math>\frac{1}{5}</math> of 15?</p>    | <p><b>12</b></p> <p>Can you say what fraction of the counters is grey?</p>  <p><math>\frac{1}{8}</math></p>  |
| <p>NPC Milestone 4:5f</p>   | <p>NPC Milestone 4:5f</p>  |

## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Teacher)

|  |  |
|--|--|
| <p><b>13</b></p> <p>A farmer has 70 eggs that she needs to put into egg boxes. Each box will hold 6 eggs.</p> <p>Can you work out how many boxes she needs for all the eggs?</p> <p style="text-align: center;"><b>12 boxes</b><br/><b>(70 ÷ 6 = 11 r 4, rounded up)</b></p> | <p><b>14</b></p> <p>Can you explain how to share 74p equally between 3 friends?<br/>How much will each friend receive?</p> <p><b>Each friend will get 24p and there will be 2p left over.</b></p>  |
| NPC Milestone 4:5g   | NPC Milestone 4:5g   |
| <p><b>15</b></p> <p>Can you solve the calculation for this array of 10-rods and 8-rods?</p>  <p style="text-align: center;"><b>8 × 28 = 224</b></p>  | <p><b>16</b></p> <p>Can you check Charlie's calculation?</p> $\begin{array}{r} 246 \\ \times \quad 4 \\ \hline 974 \\ \hline 11 \end{array}$ <p><b>This is incorrect. Charlie only exchanged 1 ten; he should have exchanged 2 tens. The correct answer is 984. Children may use apparatus to check.</b></p> |
| NPC Milestone 4:5h   | NPC Milestone 4:5h   |
| <p><b>17</b></p> <p>Can you use a short dividing calculation to answer this calculation?</p> $144 \div 9 =$ $\begin{array}{r} 16 \\ 9 \overline{) 144} \end{array}$  | <p><b>18</b></p> <p>Six children can sit around a table. Can you work out how many tables will be needed for exactly 136 children to sit?</p> <p style="text-align: center;"><b>23 tables</b></p>  |
| NPC Milestone 4:5i   | NPC Milestone 4:5i   |

## 4.5 Numicon Milestone Assessment – NPC 4 Milestone 5 (Teacher)

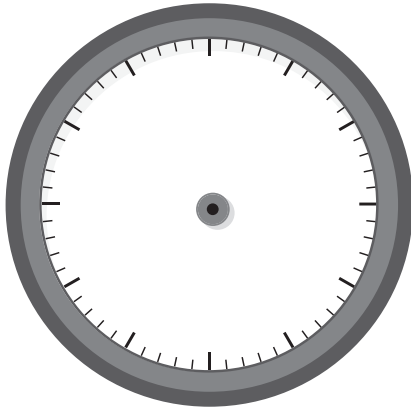
|   |   |
|---|---|
| <p><b>19</b></p> <p>Kwame calculates:</p> $236 \div 4 = 59$ <p>Can you check this calculation using a short multiplying calculation?</p> $59 \times 4 = 236$  | <p><b>20</b></p> <p>Ava bought some books which cost £10·50 each. She spent £63·00.</p> <p>Can you calculate the number of books she bought and then check your answer using a short multiplying calculation?</p> <p><b>6 (£10·50 × 6 = £63·00)</b></p> |
| <p>NPC Milestone 4:5j</p>   | <p>NPC Milestone 4:5j</p>   |
| <p><b>21</b></p> <p>Can you work out what numbers could go in the empty boxes?</p> $96 \div 4 = \square \div 4 + \square \div 4$ <p><b>Any numbers that total exactly 96, e.g. 80 ÷ 4 + 16 ÷ 4.</b></p> | <p><b>22</b></p> <p>Black ballpoint pens cost £1·62 each. How many can Kiara buy for £10·00?</p> <p><b>6</b></p>  |
| <p>NPC Milestone 4:5k</p>   | <p>NPC Milestone 4:5k</p>   |

## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

1

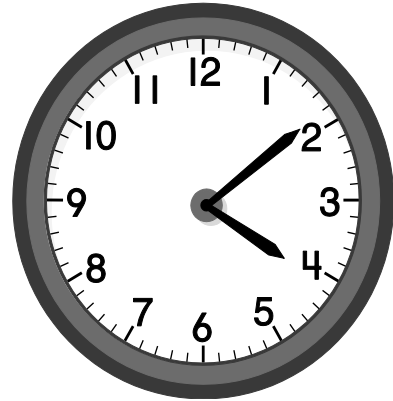
Can you record 11:43 on this clock face?



GMS Milestone 4:2a

2

Can you record the time shown on the clock as a digital time?



GMS Milestone 4:2a

3

Can you work out what the time will be 2 hours 48 minutes after 1:33 p.m.?

GMS Milestone 4:2b

4

Sian's car journey took 85 minutes. She arrived at 10 past 4 in the afternoon. Can you work out what time she left home?

GMS Milestone 4:2b

## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

5

Can you use a digital stopwatch to time how long it takes you to write the alphabet out 5 times?

Record your time in hours, minutes and seconds.

6

Turn on a digital stopwatch as you go for your lunch and stop it when you return to the classroom.

Can you record how long your lunch break was in hours, minutes and seconds?

GMS Milestone 4:2c

GMS Milestone 4:2c

7

Buses run every 30 minutes. Every bus takes the same amount of time between stops. Can you complete the bus timetable?

|                 | 1st   | 2nd   | 3rd   |
|-----------------|-------|-------|-------|
| High street     | 09:25 | 09:55 | 10:25 |
| Railway station | 09:37 | ?     | 10:37 |
| Swimming pool   | 09:54 | ?     | ?     |
| Hospital        | ?     | 10:40 | 11:10 |

From the information in the bus timetable, can you work out what time the 4th bus will leave the railway station?

Can you work out what time the 7th bus will leave the hospital?

GMS Milestone 4:2d

## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

8

Can you draw a timeline to solve this problem?

Ali's flight departs at 12:25 p.m. Ali needs to be at the airport 3 hours before his flight and it takes 40 minutes to travel there. What time should he leave home?

GMS Milestone 4:2e

9

Can you draw a timeline to solve this problem?

Cleo's flight takes off at 12:35 p.m. and she lands 135 minutes later. If she spends another 40 minutes collecting her luggage followed by 55 minutes in a taxi, what time does she arrive at her destination?

GMS Milestone 4:2e

10

Can you calculate how many minutes there are in 5 days?

GMS Milestone 4:2f

11

Can you calculate how many seconds there are in 3 hours?

GMS Milestone 4:2f

## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

12

Can you read aloud these 24-hour clock times?

13:47

08:05

23:55

GMS Milestone 4:2g

13

Can you read aloud these 24-hour clock times?

01:48

21:00

GMS Milestone 4:2g

14

Can you record each of these times as a 24-hour clock time?

7:10 p.m.

Midnight

A quarter past nine in the morning

Noon

GMS Milestone 4:2h

15

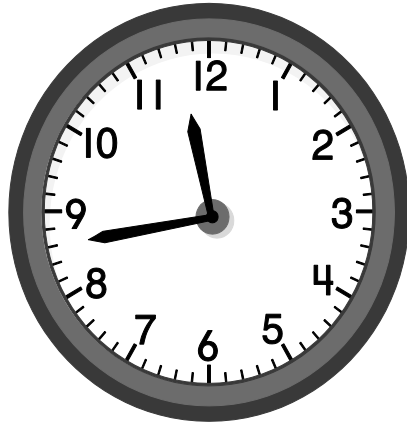
Can you explain how to convert a 12-hour clock time to 24-hour clock time?

GMS Milestone 4:2h

## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Teacher)

1

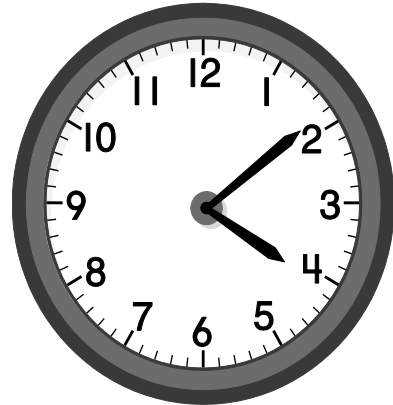
Can you record 11:43 on this clock face?



GMS Milestone 4:2a

2

Can you record the time shown on the clock as a digital time?



**04:09 (or 16:09)**

GMS Milestone 4:2a

3

Can you work out what the time will be 2 hours 48 minutes after 1:33 p.m.?

**4:21 p.m.**

GMS Milestone 4:2b

4

Sian's car journey took 85 minutes. She arrived at 10 past 4 in the afternoon.

Can you work out what time she left home?

**2:45 p.m.**

GMS Milestone 4:2b



## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Teacher)

5

Can you use a digital stopwatch to time how long it takes you to write the alphabet out 5 times?

Record your time in hours, minutes and seconds.

**Answers will vary but should be recorded as, e.g. 0 hours, 2 minutes, 12 seconds.**

6

Turn on a digital stopwatch as you go for your lunch and stop it when you return to the classroom.

Can you record how long your lunch break was in hours, minutes and seconds?

**Answers will vary but should be recorded as, e.g. 1 hours, 2 minutes, 24 seconds.**

GMS Milestone 4:2c

GMS Milestone 4:2c

7

Buses run every 30 minutes. Every bus takes the same amount of time between stops. Can you complete the bus timetable?

|                 | 1st          | 2nd          | 3rd          |
|-----------------|--------------|--------------|--------------|
| High street     | 09:25        | 09:55        | 10:25        |
| Railway station | 09:37        | <b>10:07</b> | 10:37        |
| Swimming pool   | 09:54        | <b>10:24</b> | <b>10:54</b> |
| Hospital        | <b>10:10</b> | 10:40        | 11:10        |

From the information in the bus timetable, can you work out what time the 4th bus will leave the railway station? **11:07**

Can you work out what time the 7th bus will leave the hospital? **13:10**

GMS Milestone 4:2d

## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Teacher)

|  |  |
|--|--|
| <p><b>8</b></p> <p>Can you draw a timeline to solve this problem?</p> <p>Ali's flight departs at 12:25 p.m. Ali needs to be at the airport 3 hours before his flight and it takes 40 minutes to travel there. What time should he leave home?</p> <p><b>Timeline to show answer of 8:45 a.m.</b></p> | <p><b>9</b></p> <p>Can you draw a timeline to solve this problem?</p> <p>Cleo's flight takes off at 12:35 p.m. and she lands 135 minutes later. If she spends another 40 minutes collecting her luggage followed by 55 minutes in a taxi, what time does she arrive at her destination?</p> <p><b>Timeline to show answer of 4:25 p.m.</b></p> |
| GMS Milestone 4:2e   | GMS Milestone 4:2e   |
| <p><b>10</b></p> <p>Can you calculate how many minutes there are in 5 days?</p> <p style="text-align: center;"><b>7200</b></p>   | <p><b>11</b></p> <p>Can you calculate how many seconds there are in 3 hours?</p> <p style="text-align: center;"><b>10 800</b></p>  |
| GMS Milestone 4:2f   | GMS Milestone 4:2f   |

## 4.2 Numicon Milestone Assessment – GMS 4 Milestone 2 (Teacher)

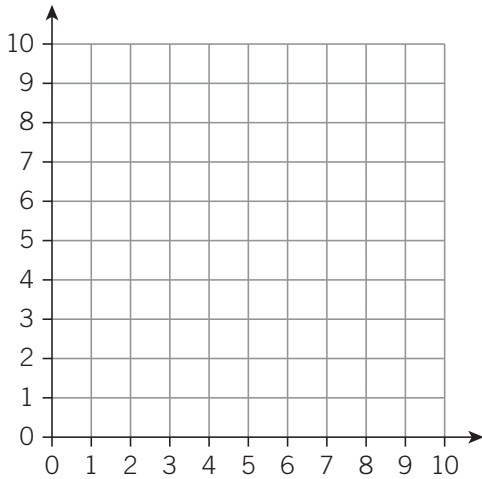
|  |   |
|--|---|
| <p><b>12</b></p> <p>Can you read aloud these 24-hour clock times?</p> <p style="text-align: center;">13:47<br/><b>Thirteen forty-seven</b></p> <p style="text-align: center;">08:10<br/><b>Eight ten</b><br/>(or ten minutes past eight)</p> <p style="text-align: center;">23:55<br/><b>Twenty-three fifty-five</b><br/>(or five minutes to midnight)</p> | <p><b>13</b></p> <p>Can you read aloud these 24-hour clock times?</p> <p style="text-align: center;">01:48<br/><b>One forty-eight</b><br/>(or forty-eight minutes past one)</p> <p style="text-align: center;">21:00<br/><b>Twenty-one hundred hours</b></p>                |
| GMS Milestone 4:2g   | GMS Milestone 4:2g  |
| <p><b>14</b></p> <p>Can you record each of these times as a 24-hour clock time?</p> <p style="text-align: center;">7:10 p.m. <b>19:10</b></p> <p style="text-align: center;">Midnight <b>00:00</b></p> <p style="text-align: center;">A quarter past nine in the morning<br/><b>09:15</b></p> <p style="text-align: center;">Noon <b>12:00</b></p>         | <p><b>15</b></p> <p>Can you explain how to convert a 12-hour clock time to 24-hour clock time?</p> <p><b>For times before 1 p.m. the times are the same. For times between 1 p.m. and 11:59 p.m. you add 12 to the hour time to show the time in the 24-hour clock.</b></p> |
| GMS Milestone 4:2h   | GMS Milestone 4:2h  |

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

1

Can you say which axis is  $y$  and which axis is  $x$ ?



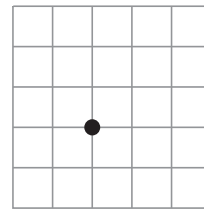
2

Lee has plotted co-ordinate A on the grid.

Can you explain to him how to plot point B?

A (2,2)

B (3,4)



GMS Milestone 4:3a

GMS Milestone 4:3a

3

Can you plot these coordinates on a  $10 \times 10$  grid and identify the polygon you have drawn?

(4,7), (6,3), (4,4), (2,3)

4

Can you plot an equilateral triangle on a  $10 \times 10$  grid and write the coordinates of each of the vertices?

GMS Milestone 4:3b

GMS Milestone 4:3b

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

5

On a  $10 \times 10$  grid, start with a counter on (1,1).  
Can you translate the counter and describe the movements you make for it to end at (6,8)?

GMS Milestone 4:3c

6

Asha translates a counter using these movements: left 3, down 6, right 5, up 7.  
The counter finishes on (5,9).  
Can you work out what coordinate it started on?

GMS Milestone 4:3c

7

Can you work out how many 1p coins are equivalent in value to £1.05?

GMS Milestone 4:3d

8

Can you convert 910 pennies into pounds and write the amount?

GMS Milestone 4:3d

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

9



Can you total the amount and write it using a pound sign?

10



Can you read and write this amount?

GMS Milestone 4:3e

GMS Milestone 4:3e

11

£3.65

Can you say what this amount would be, rounded to the nearest pound?

12

Can you give an example of when it might be helpful to round an amount of money to the nearest pound?

GMS Milestone 4:3f

GMS Milestone 4:3f

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

13

Here are William's and Joseph's forms for a sponsored walk around a field. Joseph wants to raise more money than William.

Joseph says, "If I complete 6 laps I will raise more money than you."

William disagrees.

| Joseph  |                |       | William |               |       |
|---------|----------------|-------|---------|---------------|-------|
| Sponsor | Amount per lap | Total | Sponsor | Single amount | Total |
| Abby    | £1.50          |       | Sam     | £4.50         |       |
| Conor   | £2.00          |       | Vera    | £10.00        |       |
| Dave    | £0.50          |       | Esme    | £8.00         |       |
| Leonie  | £1.50          |       | Jacob   | £6.50         |       |
| Joel    | £1.00          |       | Marya   | £7.50         |       |
| Grace   | £0.50          |       | Robbie  | £5.50         |       |

Can you work out each sponsorship total and say whether you agree with Joseph?

Who will raise most money if they both do 10 laps?

GMS Milestone 4:3g

14

What you would use to measure the length of the school hall?

Can you give a reasonable estimate of its length?

GMS Milestone 4:3h

15

What would you use to measure the length of a pencil?

Can you give a reasonable estimate of its length?

GMS Milestone 4:3h

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

16

Can you write as a decimal number the length that is one and a half metres more than  $2.25$  m?

17

Polly says that  $12.75$  m is read as 12 point seventy-five metres. Can you say whether you agree with Polly and explain your answer?

GMS Milestone 4:3i

GMS Milestone 4:3i

18

Can you convert  $16.25$  cm into millimetres?

19

Can you work out how many kilometres there are in 838 metres?

GMS Milestone 4:3j

GMS Milestone 4:3j



### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

20

In a competition, 6 children each throw a discus as far as they can. The results are shown below. Can you record the distances in a table, in order, from first place to sixth place?

22·45 m

18·76 m

24·38 m

21·21 m

24·42 m

19·89 m

GMS Milestone 4:3k

21

Here are the discus throws for 6 children:

24·42 m

24·38 m

22·45 m

21·21 m

19·98 m

18·76 m

Milly rounds these discus throws to the nearest half metre.

Then she draws a bar chart to show the results.

Can you draw this bar chart too?

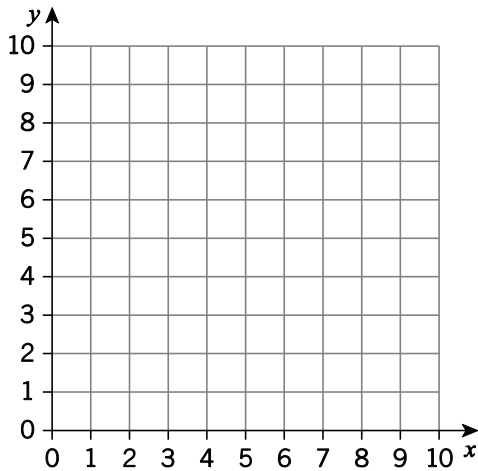
Can you find the difference between two of these throws from your chart?

GMS Milestone 4:3k

## 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Teacher)

1

Can you say which axis is  $y$  and which axis is  $x$ ?

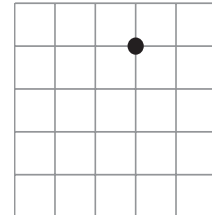
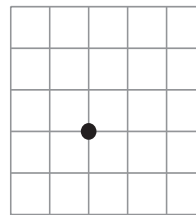


2

Lee has plotted co-ordinate A on the grid.  
Can you explain to him how to plot point B?

A (2,2)

B (3,4)



**From the bottom left corner, count 3 along to the right then 4 up.**

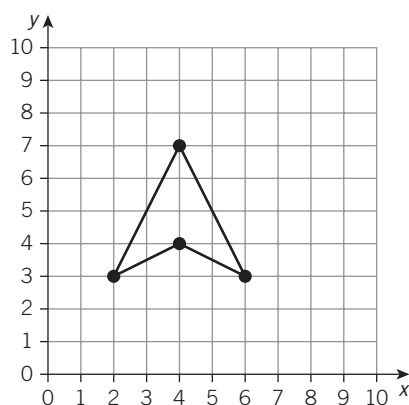
GMS Milestone 4:3a

GMS Milestone 4:3a

3

Can you plot these coordinates on a  $10 \times 10$  grid and identify the polygon you have drawn?

(4,7), (6,3), (4,4), (2,3)



**Inverted kite**

4

Can you plot an equilateral triangle on a  $10 \times 10$  grid and write the coordinates of each of the vertices?

**Coordinates will vary but the sides and angles must all be equal.**



GMS Milestone 4:3b

GMS Milestone 4:3b

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Teacher)

|  |   |
|--|---|
| <p><b>5</b></p> <p>On a <math>10 \times 10</math> grid, start with a counter on (1,1).<br/>Can you translate the counter and describe the movements you make for it to end at (6,8)?</p> <p style="text-align: center;"><b>right 5, up 7</b></p> | <p><b>6</b></p> <p>Asha translates a counter using these movements: left 3, down 6, right 5, up 7.<br/>The counter finishes on (5,9).<br/>Can you work out what coordinate it started on?</p> <p style="text-align: center;"><b>(3,8)</b></p> |
| GMS Milestone 4:3c   | GMS Milestone 4:3c  |
| <p><b>7</b></p> <p>Can you work out how many 1p coins are equivalent in value to £1.05?</p> <p style="text-align: center;"><b>105</b></p>  | <p><b>8</b></p> <p>Can you convert 910 pennies into pounds and write the amount?</p> <p style="text-align: center;"><b>£9.10</b></p>  |
| GMS Milestone 4:3d   | GMS Milestone 4:3d  |

## 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Teacher)

|   |  |
|---|--|
| <p>9</p>  <p>Can you total the amount and write it using a pound sign?</p> <p style="text-align: center;"><b>£4·02</b></p> | <p>10</p>  <p>Can you read and write this amount?</p> <p style="text-align: center;"><b>Five pounds and five pence</b></p> <p style="text-align: center;"><b>£5·05</b></p> |
| GMS Milestone 4:3e  | GMS Milestone 4:3e   |
| <p>11</p> <p style="text-align: center;">£3·65</p> <p>Can you say what this amount would be, rounded to the nearest pound?</p> <p style="text-align: center;"><b>£4</b></p>                                 | <p>12</p> <p>Can you give an example of when it might be helpful to round an amount of money to the nearest pound?</p> <p><b>Answers will vary, e.g. when adding amounts and you only need an approximate total.</b></p>                                     |
| GMS Milestone 4:3f  | GMS Milestone 4:3f   |

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Teacher)

13

Here are William's and Joseph's forms for a sponsored walk around a field. Joseph wants to raise more money than William.

Joseph says, "If I complete 6 laps I will raise more money than you."

William disagrees.

| Joseph  |                |               | William |               |               |
|---------|----------------|---------------|---------|---------------|---------------|
| Sponsor | Amount per lap | Total         | Sponsor | Single amount | Total         |
| Abby    | £1.50          | <b>£9.00</b>  | Sam     | £4.50         | <b>£4.50</b>  |
| Conor   | £2.00          | <b>£12.00</b> | Vera    | £10.00        | <b>£10.00</b> |
| Dave    | £0.50          | <b>£3.00</b>  | Esme    | £8.00         | <b>£8.00</b>  |
| Leonie  | £1.50          | <b>£9.00</b>  | Jacob   | £6.50         | <b>£6.50</b>  |
| Joel    | £1.00          | <b>£6.00</b>  | Marya   | £7.50         | <b>£7.50</b>  |
| Grace   | £0.50          | <b>£3.00</b>  | Robbie  | £5.50         | <b>£5.50</b>  |

Can you work out each sponsorship total and say whether you agree with Joseph?

Who will raise most money if they both do 10 laps?

**Each total is £42 so Joseph is incorrect; he would need to do 7 laps to beat William.**

**If they both do 10 laps, Joseph will raise more because he raises more money for every extra lap he walks.**

GMS Milestone 4:3g

14

What you would use to measure the length of the school hall?

Can you give a reasonable estimate of its length?

**A trundle wheel would be quickest. Estimates will vary, depending on the size of the hall.**

GMS Milestone 4:3h

15

What would you use to measure the length of a pencil?

Can you give a reasonable estimate of its length?

**A ruler. Estimates will vary, depending on the size of the pencil.**

GMS Milestone 4:3h

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Teacher)

|   |  |
|---|--|
| <p><b>16</b></p> <p>Can you write as a decimal number the length that is one and a half metres more than 2·25 m?</p> <p style="text-align: center;"><b>3·75 m</b></p> | <p><b>17</b></p> <p>Polly says that 12·75 m is read as 12 point seventy-five metres. Can you say whether you agree with Polly and explain your answer?</p> <p><b>Polly is incorrect.<br/>12·75 m should be read as<br/>12 point seven five metres.</b></p> |
| GMS Milestone 4:3i  | GMS Milestone 4:3i   |
| <p><b>18</b></p> <p>Can you convert 16·25 cm into millimetres?</p> <p style="text-align: center;"><b>162·5 mm</b></p>   | <p><b>19</b></p> <p>Can you work out how many kilometres there are in 838 metres?</p> <p style="text-align: center;"><b>0·838 km</b></p>   |
| GMS Milestone 4:3j  | GMS Milestone 4:3j   |

### 4.3 Numicon Milestone Assessment – GMS 4 Milestone 3 (Teacher)

20

In a competition, 6 children each throw a discus as far as they can. The results are shown below. Can you record the distances in a table, in order, from first place to sixth place?

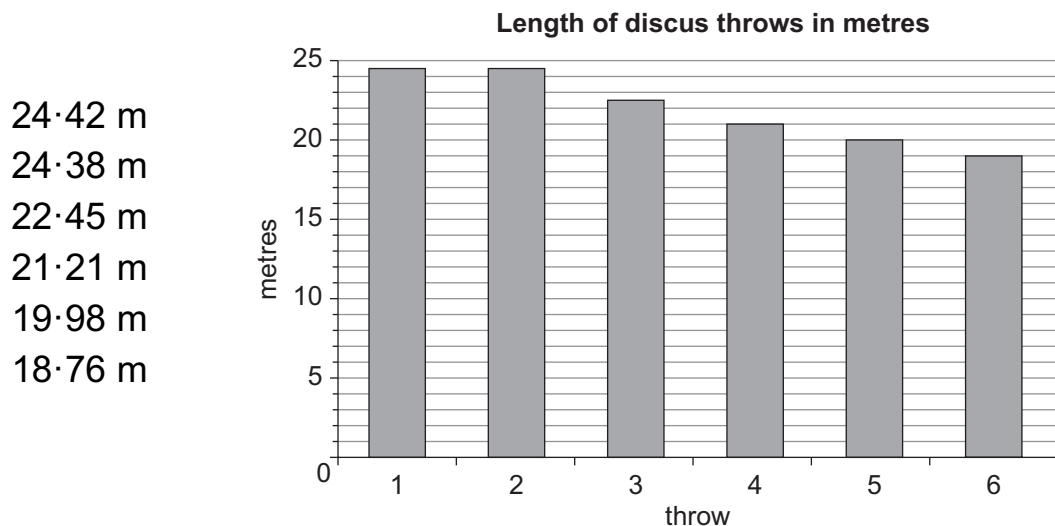
22·45 m  
 18·76 m  
 24·38 m  
 21·21 m  
 24·42 m  
 19·98 m

|   |        |
|---|--------|
| 1 | 24·42m |
| 2 | 24·38m |
| 3 | 22·45m |
| 4 | 21·21m |
| 5 | 19·98m |
| 6 | 18·76m |

GMS Milestone 4:3k

21

Here are the discus throws for 6 children. Milly rounds these discus throws to the nearest half metre. Then she draws a bar chart to show the results. Can you draw this bar chart too?



Can you find the difference between two of these throws from your chart?

**Example differences from the chart could be: 1 m, 1·5 m, 2 m.**

GMS Milestone 4:3k

## 4.4 Numicon Milestone Assessment – GMS 4 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

1

Can you use digital scales to find the mass of 6 items that you are given?  
Can you record your findings in a table in grams and convert this mass to kilograms?

2

Can you check to see if Sam's table is correct?

| Grams    | Kilograms and grams | Kilograms |
|----------|---------------------|-----------|
| 45 g     | 0 kg 45 g           | 0.45 kg   |
| 322 g    | 3 kg 220 g          | 3.22 kg   |
| 12 084 g | 12 kg 840 g         | 12.084 kg |
| 70 051 g | 7 kg 51 g           | 7.051 kg  |

GMS Milestone 4:4a

GMS Milestone 4:4a

3

Other than packing a bag, can you give an example of when it would be useful to estimate the total mass of a set of objects?

4

$2\frac{8}{10}$  kg, 0.3 kg,  $7\frac{1}{2}$  kg, 6.4 kg,  
3 kg 600g

Can you provide an estimate of the total mass? How did you reach your total?

GMS Milestone 4:4b

GMS Milestone 4:4b



## 4.4 Numicon Milestone Assessment – GMS 4 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

5

Erika's parcel has a mass of 2.6 kg. Can you calculate the total mass for 7 identical parcels?

6

Mario eats one 390 g tin of fruit each week. Theo eats  $\frac{3}{4}$  of the same size bar each week.

Can you calculate how much more fruit Mario has eaten after 5 weeks than Theo?

Can you explain your thinking?

GMS Milestone 4:4c

GMS Milestone 4:4c

7

Can you explain the difference between the volume and the capacity of a cup?

8

The sink in my bathroom holds about 3 kettles of water.

Can you give a good estimate, in litres, of the capacity of my sink?  
Can you explain your reasoning?

GMS Milestone 4:4d

GMS Milestone 4:4d

## 4.4 Numicon Milestone Assessment – GMS 4 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

9

Can you use a 250 ml measuring jug to measure

$$2\frac{3}{4} \text{ l ?}$$

10

Can you use 200 ml and 300 ml beakers to measure out 1.7 l? What is the fewest number of beaker fills you need to make?

GMS Milestone 4:4e

GMS Milestone 4:4e

11

Can you convert these measurements?

$$4.7 \text{ l} = \square \text{ ml}$$

$$\square \text{ ml} = 10 \text{ l}$$

$$2045 \text{ ml} = \square \text{ l}$$

12

Can you circle the items you would measure in litres?

Capacity of a bucket

Dose of medicine

Capacity of a mug

Capacity of a vase

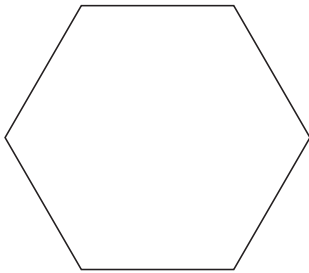
GMS Milestone 4:4f

GMS Milestone 4:4f



Answers are on the answer pages that follow.

13



Can you explain how to find the perimeter of this regular polygon?

GMS Milestone 4:4g

14

Can you explain how you would find the perimeter of a rhombus?

GMS Milestone 4:4g

15

Can you draw two different polygons that each have a perimeter of 14 cm?

GMS Milestone 4:4h

16

Is it possible to have a scalene, an isosceles and an equilateral triangle with the same perimeter? Can you make a model to show your thinking?

GMS Milestone 4:4h

## 4.4 Numicon Milestone Assessment – GMS 4 Milestone 4 (Pupil)



Answers are on the answer pages that follow.

17

Can you explain what the difference is between area and perimeter?

18

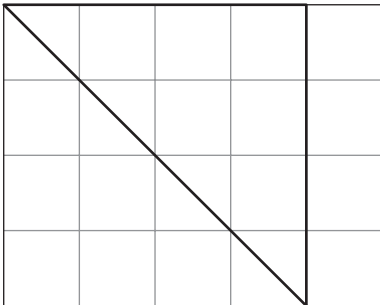
Can you make a model to show the area of a rectangle? Can you make a different model to show its perimeter?

GMS Milestone 4:4i

GMS Milestone 4:4i

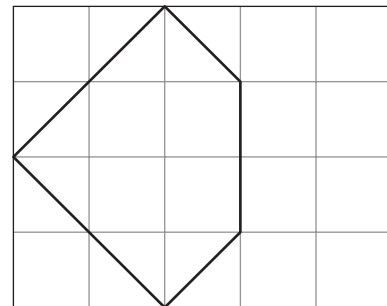
19

Can you work out the area of this triangle?



20

Can you work out the area of this shape?



GMS Milestone 4:4j

GMS Milestone 4:4j

## 4.4 Numicon Milestone Assessment – GMS 4 Milestone 4 (Teacher)

| <p><b>1</b></p> <p>Can you use digital scales to find the mass of 6 items that you are given? Can you record your findings in a table in grams and convert this mass to kilograms?</p> <p><b>Answers will vary. Check that children have measured accurately and then converted correctly.</b></p>   | <p><b>2</b></p> <p>Can you check to see if Sam's table is correct?</p> <table border="1" data-bbox="874 421 1452 766"> <thead> <tr> <th>Grams</th> <th>Kilograms and grams</th> <th>Kilograms</th> </tr> </thead> <tbody> <tr> <td>45 g</td> <td>0 kg 45 g</td> <td>0·045 kg</td> </tr> <tr> <td>3220 g</td> <td>3 kg 220 g</td> <td>3·22 kg</td> </tr> <tr> <td>12 084 g</td> <td>12 kg 84 g</td> <td>12·084 kg</td> </tr> <tr> <td>7051 g</td> <td>7 kg 51 g</td> <td>7·051 kg</td> </tr> </tbody> </table> | Grams     | Kilograms and grams | Kilograms | 45 g | 0 kg 45 g | 0·045 kg | 3220 g | 3 kg 220 g | 3·22 kg | 12 084 g | 12 kg 84 g | 12·084 kg | 7051 g | 7 kg 51 g | 7·051 kg |
|--|---|-----------|---------------------|-----------|------|-----------|----------|--------|------------|---------|----------|------------|-----------|--------|-----------|----------|
| Grams  | Kilograms and grams   | Kilograms |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |
| 45 g   | 0 kg 45 g   | 0·045 kg  |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |
| 3220 g   | 3 kg 220 g  | 3·22 kg   |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |
| 12 084 g   | 12 kg 84 g  | 12·084 kg |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |
| 7051 g   | 7 kg 51 g   | 7·051 kg  |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |
| GMS Milestone 4:4a   | GMS Milestone 4:4a  |           |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |
| <p><b>3</b></p> <p>Other than packing a bag, can you give an example of when it would be useful to estimate the total mass of a set of objects?</p> <p><b>Examples may include the total mass of items in a cardboard box before it gets too heavy, the total mass of people in a lift before it reaches its maximum allowed weight.</b></p> | <p><b>4</b></p> <p><math>2\frac{8}{10}</math> kg, 0·3 kg, <math>7\frac{1}{2}</math> kg, 6·4 kg, 3 kg 600 g</p> <p>Can you provide an estimate of the total mass? How did you reach your total?</p> <p><b>21 kg, estimating by rounding up or down to the nearest half kilogram.</b></p>   |           |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |
| GMS Milestone 4:4b   | GMS Milestone 4:4b  |           |                     |           |      |           |          |        |            |         |          |            |           |        |           |          |

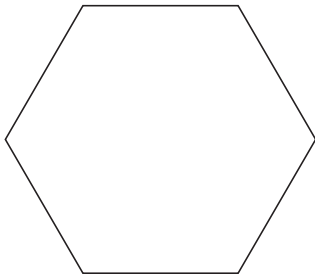
**4.4 Numicon Milestone Assessment – GMS 4 Milestone 4 (Teacher)**

|  |  |
|--|--|
| <p><b>5</b></p> <p>Erika's parcel has a mass of 2.6 kg. Can you calculate the total mass for 7 identical parcels?</p> <p style="text-align: center;"><b>18.2 kg</b></p>                                | <p><b>6</b></p> <p>Mario eats one 390 g tin of fruit each week. Theo eats <math>\frac{3}{4}</math> of the same size tin each week.</p> <p>Can you calculate how much more fruit Mario has eaten after 5 weeks than Theo?</p> <p>Can you explain your thinking?</p> <p style="text-align: center;"><b>487.5 g</b></p> <p><b>Explanations will vary. Example:</b></p> <p><b>Mario:</b> <math>390 \text{ g} \times 5 \text{ weeks} = 1950 \text{ g}</math></p> <p><b>Theo:</b> <math>\frac{3}{4} \times 1950 \text{ g} = 1462.5 \text{ g}</math></p> <p><b>Difference:</b> <math>1950 - 1462.5 = 487.5 \text{ g}</math></p> |
| GMS Milestone 4:4c   | GMS Milestone 4:4c   |
| <p><b>7</b></p> <p>Can you explain the difference between the volume and the capacity of a cup?</p> <p><b>Volume is the amount of space a cup takes up; capacity is the amount a cup can hold.</b></p> | <p><b>8</b></p> <p>The sink in my bathroom holds about 3 kettles of water.</p> <p>Can you give a good estimate, in litres, of the capacity of my sink?</p> <p>Can you explain your reasoning?</p> <p><b>5 l. Most kettles hold between 1.5 l and 2 l.</b></p>  |
| GMS Milestone 4:4d   | GMS Milestone 4:4d   |

## 4.4 Numicon Milestone Assessment – GMS 4 Milestone 4 (Teacher)

|   |  |
|---|--|
| <p><b>9</b></p> <p>Can you use a 250 ml measuring jug to measure</p> $2\frac{3}{4}\ell?$ <p><b>This is a practical task. Children should find that they need to fill the measuring jug 11 times to measure out <math>2\frac{3}{4}\ell</math>.</b></p> | <p><b>10</b></p> <p>Can you use 200 ml and 300 ml beakers to measure out 1.7 ℓ? What is the fewest number of beaker fills you need to make?</p> <p><b>The fewest number will be 5 × 300 ml and 1 × 200 ml.</b></p> |
| GMS Milestone 4:4e  | GMS Milestone 4:4e   |
| <p><b>11</b></p> <p>Can you convert these measurements?</p> <p>4.7 ℓ = <b>4700</b> ml</p> <p><b>10 000</b> ml = 10 ℓ</p> <p>2045 ml = <b>2.045</b> ℓ</p>  | <p><b>12</b></p> <p>Can you circle the items you would measure in litres?</p> <p><b>Capacity of a bucket</b></p> <p>Dose of medicine</p> <p>Capacity of a mug</p> <p><b>Capacity of a vase</b></p>                 |
| GMS Milestone 4:4f  | GMS Milestone 4:4f   |

13



Can you explain how to find the perimeter of this regular polygon?

**Measure one of its sides and multiply this by 6.**

GMS Milestone 4:4g

14

Can you explain how you would find the perimeter of a rhombus?

**Measure one of its sides and multiply this by 4.**

GMS Milestone 4:4g

15

Can you draw two different polygons that each have a perimeter of 14 cm?

**Answers will vary. Check children's drawings.**

GMS Milestone 4:4h

16

Is it possible to have a scalene, an isosceles and an equilateral triangle with the same perimeter? Can you make a model to show your thinking?

**Any models of triangles, using number rods, where the internal measurements add to the same total.**

GMS Milestone 4:4h



17

Can you explain what the difference is between area and perimeter?

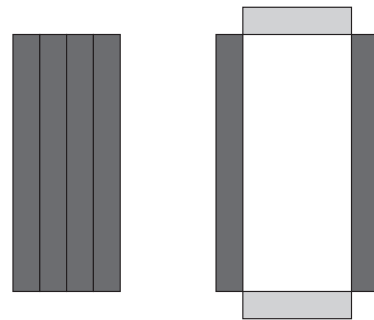
**Area is the amount of surface a shape covers.**

**Perimeter is the distance around the outside of a shape.**

18

Can you make a model to show the area of a rectangle? Can you make a different model to show its perimeter?

**Models, using numbers rods, that clearly represent area and perimeter, e.g.**

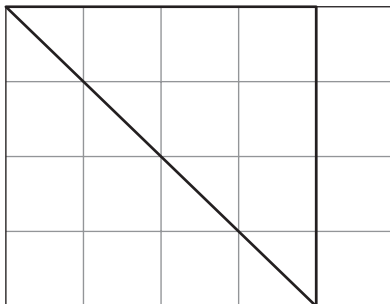


GMS Milestone 4:4i

GMS Milestone 4:4i

19

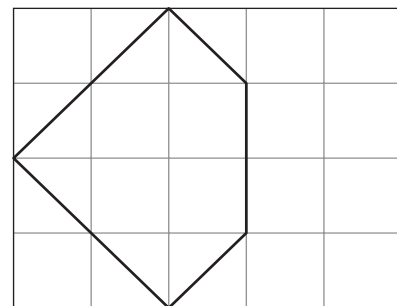
Can you work out the area of this triangle?



**8 cm<sup>2</sup>**

20

Can you work out the area of this shape?



**7 cm<sup>2</sup>**

GMS Milestone 4:4j

GMS Milestone 4:4j

## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Pupil)

Answers are on the answer pages that follow.

1

Can you write three and a half as a decimal fraction?

2

Can you write the decimal equivalents of  $\frac{1}{4}$  and  $\frac{3}{4}$ ?

NPC Milestone 4:6a

NPC Milestone 4:6a

3

Can you make some models to show fractions that are equivalent to  $\frac{1}{5}$ ?

4

Can you draw some diagrams to show fractions that are equivalent to  $\frac{2}{3}$ ?

NPC Milestone 4:6b

NPC Milestone 4:6b

5

Can you calculate

$$\frac{1}{12} + \frac{7}{12} ?$$

6

Can you calculate

$$\frac{43}{100} - \frac{18}{100} ?$$

NPC Milestone 4:6c

NPC Milestone 4:6c

## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Pupil)

Answers are on the answer pages that follow.

7

Can you write the decimal equivalent fractions for

$$\frac{8}{10}, \frac{3}{10}, \frac{5}{10} ?$$

NPC Milestone 4:6d

8

Can you write the decimal equivalent fractions for

$$\frac{71}{100}, \frac{60}{100}, \frac{3}{100} ?$$

NPC Milestone 4:6d

9

Can you divide 68 by 100 and write the answer as a decimal fraction?

NPC Milestone 4:6e

10

Can you calculate  $0.2 \div 10$ ?

NPC Milestone 4:6e

11

Can you sort these decimal fractions from smallest to largest?

$$1.21, 1.02, 2.02, 0.22, 2.12$$

NPC Milestone 4:6f

12

Can you describe how to order these decimal fractions from largest to smallest?

$$7.54, 6.78, 9.73, 7.5, 8.49$$

NPC Milestone 4:6f

## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Pupil)

Answers are on the answer pages that follow.

13

Jodie creates a sequence.

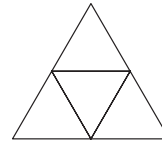
Here is part of it:

2, 9, 23, 51, 107

Can you work out her rule?

NPC Milestone 4:6g

14



Jayesh adds a row of triangles to his growing pattern. Each new row grows the equilateral triangle.

Can you work out how many triangles there will be in the 5th row?

NPC Milestone 4:6g

15

You have 4 pegs of different colours. Can you record all the possible ways to arrange them on the 4-shape? How do you know you have found all the possible ways?

NPC Milestone 4:6h

16

Can you explain how to systematically find all the combinations of number rods that are equivalent to the 4-rod, if you are using the 1-rods, 2-rods and 3-rods?

NPC Milestone 4:6h

17

There are 11 number bond facts for 10. Can you predict how many number bond facts there will be for 30, including 0 and 30?

NPC Milestone 4:6i

18

Andy says he can make 15 in 3 different ways using 2 different Numicon Shapes. He says there will be 9 different ways if he uses 3 different Shapes. Can you say whether or not you agree with him?

NPC Milestone 4:6i

## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Pupil)

Answers are on the answer pages that follow.

19

An odd number divided by 2 will always give  $\frac{1}{2}$  or 0.5 in the answer.

Can you describe what happens when an odd number is divided by 4?

Can you explain your thinking?

NPC Milestone 4:6j

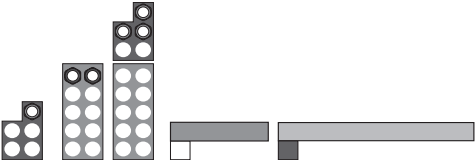
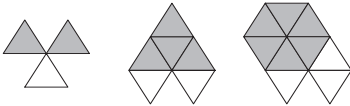
20

All even numbers are a double of a number.

Can you say if this statement is sometimes true, always true or never true?

NPC Milestone 4:6j

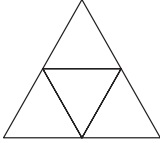
## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Teacher)

|  |   |
|--|---|
| <p><b>1</b></p> <p>Can you write three and a half as a decimal fraction?</p> <p style="text-align: center;"><b>3.5</b></p>   | <p><b>2</b></p> <p>Can you write the decimal equivalents of <math>\frac{1}{4}</math> and <math>\frac{3}{4}</math> ?</p> <p style="text-align: center;"><b>0.25 and 0.75</b></p>   |
| NPC Milestone 4:6a   | NPC Milestone 4:6a  |
| <p><b>3</b></p> <p>Can you make some models to show fractions that are equivalent to <math>\frac{1}{5}</math>?</p> <p><b>Examples:</b></p>  | <p><b>4</b></p> <p>Can you draw some diagrams to show fractions that are equivalent to <math>\frac{2}{3}</math>?</p> <p><b>Examples:</b></p>  |
| NPC Milestone 4:6b   | NPC Milestone 4:6b  |
| <p><b>5</b></p> <p>Can you calculate</p> $\frac{1}{12} + \frac{7}{12} ?$ $\frac{8}{12} \text{ or } \frac{4}{6} \text{ or } \frac{2}{3}$  | <p><b>6</b></p> <p>Can you calculate</p> $\frac{43}{100} - \frac{18}{100} ?$ $\frac{25}{100} \text{ or } \frac{1}{4}$   |
| NPC Milestone 4:6c   | NPC Milestone 4:6c  |

## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Teacher)

|   |   |
|---|---|
| <p><b>7</b></p> <p>Can you write the decimal equivalent fractions for</p> $\frac{8}{10}, \frac{3}{10}, \frac{5}{10}?$ <p><b>0.8, 0.3, 0.5</b></p>                     | <p><b>8</b></p> <p>Can you write the decimal equivalent fractions for</p> $\frac{71}{100}, \frac{60}{100}, \frac{3}{100}?$ <p><b>0.71, 0.6, 0.03</b></p>  |
| <p>NPC Milestone 4:6d</p>   | <p>NPC Milestone 4:6d</p>   |
| <p><b>9</b></p> <p>Can you divide 68 by 100 and write the answer as a decimal fraction?</p> <p><b>0.68</b></p>  | <p><b>10</b></p> <p>Can you calculate <math>0.2 \div 10</math>?</p> <p><b>0.02</b></p>  |
| <p>NPC Milestone 4:6e</p>   | <p>NPC Milestone 4:6e</p>   |
| <p><b>11</b></p> <p>Can you sort these decimal fractions from smallest to largest?</p> <p>1.21, 1.02, 2.02, 0.22, 2.12</p> <p><b>0.22, 1.02, 1.21, 2.02, 2.12</b></p> | <p><b>12</b></p> <p>Can you describe how to order these decimal fractions from largest to smallest?</p> <p>7.54, 6.78, 9.73, 7.5, 8.49</p> <p><b>Start by looking at the whole number. If that is the same, look at the tenths and then the hundredths.</b></p> |
| <p>NPC Milestone 4:6f</p>   | <p>NPC Milestone 4:6f</p>   |

## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Teacher)

|   |   |
|---|---|
| <p><b>13</b></p> <p>Jodie creates a sequence.</p> <p>Here is part of it:</p> <p style="text-align: center;">2, 9, 23, 51, 107</p> <p>Can you work out her rule?</p> <p><b>The difference between the numbers is double the previous difference.</b></p>   | <p><b>14</b></p> <div style="text-align: center;">  </div> <p>Jayesh adds a row of triangles to his growing pattern. Each new row grows the equilateral triangle.</p> <p>Can you work out how many triangles there will be in the 5th row?</p> <p style="text-align: center;"><b>9 triangles</b></p> |
| NPC Milestone 4:6g  | NPC Milestone 4:6g  |
| <p><b>15</b></p> <p>You have 4 pegs of different colours. Can you record all the possible ways to arrange them on the 4-shape? How do you know you have found all the possible ways?</p> <p><b>There are 24 different ways in total; 6 for each of the colours starting in the top-left position.</b></p> | <p><b>16</b></p> <p>Can you explain how to systematically find all the combinations of number rods that are equivalent to the 4-rod, if you are using the 1-rods, 2-rods and 3-rods?</p> <p><b>Start with four 1-rods; then two 1-rods and one 2-rod; then one 1-rod and one 3-rod ...</b></p>  |
| NPC Milestone 4:6h  | NPC Milestone 4:6h  |
| <p><b>17</b></p> <p>There are 11 number bond facts for 10. Can you predict how many number bond facts there will be for 30, including 0 and 30?</p> <p style="text-align: center;"><b>31</b></p>  | <p><b>18</b></p> <p>Andy says he can make 15 in 3 different ways using 2 different Numicon Shapes. He says there will be 9 different ways if he uses 3 different Shapes. Can you say whether or not you agree with him?</p> <p><b>Yes, he is correct.</b></p>   |
| NPC Milestone 4:6i  | NPC Milestone 4:6i  |



## 4.6 Numicon Milestone Assessment – NPC 4 Milestone 6 (Teacher)

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An odd number divided by 2 will always give  $\frac{1}{2}$  or 0.5 in the answer.

Can you describe what happens when an odd number is divided by 4?

Can you explain your thinking?

**It will always give  $\frac{1}{4}$  or 0.25, or  $\frac{3}{4}$  or 0.75 in the answer because there will either be 1 or 3 left over.**

NPC Milestone 4:6j

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All even numbers are a double of a number.

Can you say if this statement is sometimes true, always true or never true?

**Always true**

NPC Milestone 4:6j