CAMBRIDGE

Primary Mathematics

Teacher's Resource 3

Cherri Moseley & Janet Rees

› Contents

Acknowledgements

Digital resources

The following items are available on Cambridge GO. For more information on how to access and use your digital resource, please see the inside front cover.

Active learning

Assessment for Learning

Developing learners' language skills

Differentiation

Improving learning through questioning

Language awareness

Metacognition

Skills for Life

Developing mental strategies

Letter for parents – Introducing the Cambridge Primary and Lower Secondary resources

Lesson plan template and examples of completed lesson plans

Curriculum framework correlation

Scheme of work

Diagnostic check and mark scheme

Mid-point test and mark scheme

End-of-year test and mark scheme

Answers to Learner's Book questions

Answers to Workbook questions

Glossary

You can download the following resources for each unit:

Additional teaching ideas

Differentiated worksheets and answers

Language worksheets and answers

Resource sheets

〉 Introduction

Welcome to the new edition of our Cambridge Primary Mathematics series.

Since its launch, the series has been used by teachers and learners in over 100 countries for teaching the Cambridge Primary Mathematics curriculum framework.

This exciting new edition has been designed by talking to Primary Mathematics teachers all over the world. We have worked hard to understand your needs and challenges, and then carefully designed and tested the best ways of meeting them.

As a result of this research, we've made some important changes to the series. This Teacher's Resource has been carefully redesigned to make it easier for you to plan and teach the course.

The series still has extensive digital and online support and includes Digital Classroom, which lets you share books with your class and play videos and audio. This Teacher's Resource also offers additional materials that are available to download from Cambridge GO. (For more information on how to access and use your digital resource, please see the inside front cover.)

The series uses the most successful teaching approaches like active learning and metacognition, and this Teacher's Resource gives you full guidance on how to integrate them into your classroom.

Formative assessment opportunities help you to get to know your learners better, with clear learning objectives and success criteria, as well as an array of assessment techniques, including advice on self and peer assessment.

Clear, consistent differentiation ensures that all learners are able to progress in the course with tiered activities, differentiated worksheets and advice about supporting learners' different needs.

All our resources are written for teachers and learners who use English as a second or additional language. They help learners build core English skills with vocabulary and grammar support, as well as additional language worksheets.

We hope you enjoy using this course.

Eddie Rippeth

Head of Primary and Lower Secondary Publishing, Cambridge University Press

⟩ About the authors

Cherri Moseley

After teaching in a range of primary schools, Cherri became a mathematics consultant, working for various providers and independently. She has worked with a wide range of publishers, writing a variety of mathematics resources for teachers. For several years Cherri led mathematical videoconferences with different schools around the world for Motivate, part of the Cambridge Millennium Mathematics Project, and twice travelled to Africa to work with disadvantaged teachers to develop their mathematics subject knowledge and teaching. She has also visited schools in Hungary and Portugal to explore teaching methods and approaches.

Cherri is an active member of the Mathematical Association. She is a member of the Primary Group and Senior Editor of *Primary Mathematics*, the Mathematical Association's journal specifically for those interested in primary mathematics education.
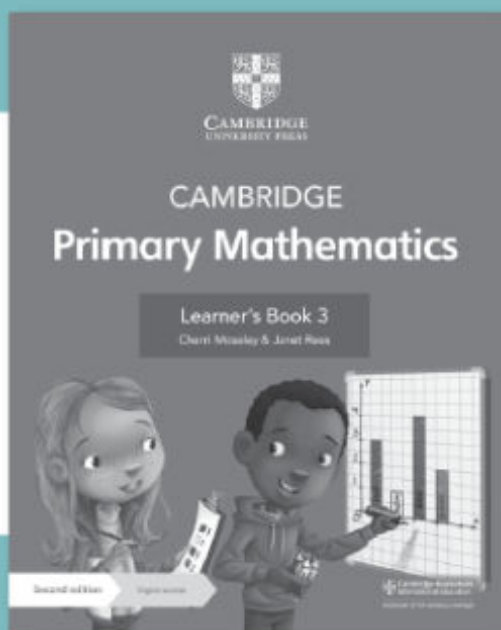
Janet Rees

As a teacher and then head teacher of both mainstream and special units, working with children with varying needs, Janet became an advisory teacher for primary mathematics and then a trainer for the National Numeracy Strategy across the East of England.

She has since worked as an independent trainer for all aspects of learning and teaching but specialising in primary mathematics for children aged 4 to 11 years in both mainstream and special schools. This has included training and writing, and working with parents and other educators and with a range of publishers both here and abroad. Janet has extensive experience writing and developing teacher resources and training materials, and has delivered training around the world.
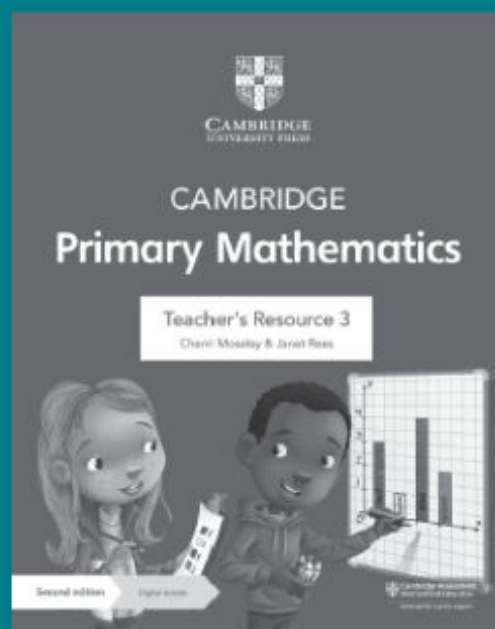
> How to use this series

All of the components in the series are designed to work together.

CAMBRIDGE
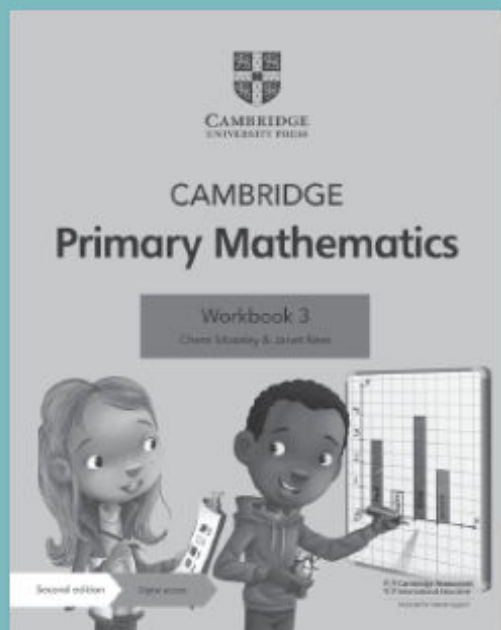Primary Mathematics
Learner's Book 3

The Learner's Book is designed for learners to use in class with guidance from the teacher. It offers complete coverage of the curriculum framework. A variety of investigations, activities, questions and images motivate learners and help them to develop the necessary mathematical skills. Each unit contains opportunities for formative assessment, differentiation and reflection so you can support your learners' needs and help them progress.

The Teacher's Resource is the foundation of this series and you'll find everything you need to deliver the course in here, including suggestions for differentiation, formative assessment and language support, teaching ideas, answers, tests and extra worksheets. Each Teacher's Resource includes:

- a **print book** with detailed teaching notes for each topic

- **Digital Access** with all the material from the book in digital form plus editable planning documents, extra guidance, downloadable worksheets and more.

CAMBRIDGE
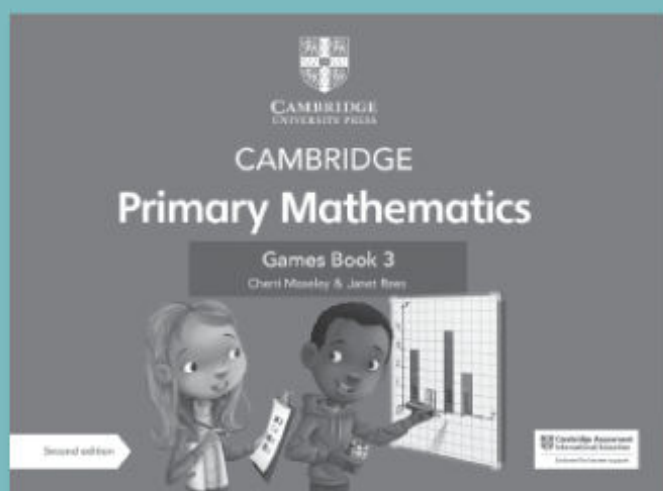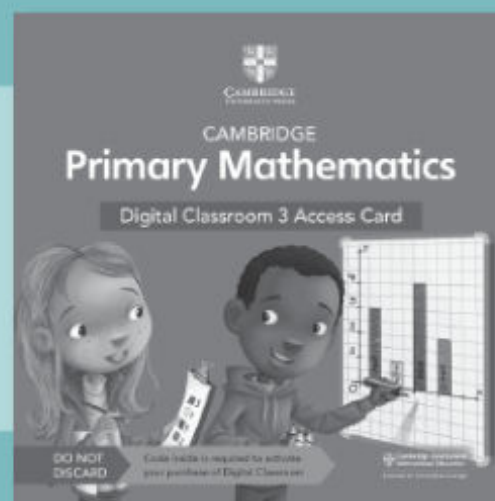Primary Mathematics
Teacher's Resource 3

The skills-focused write-in Workbook provides further practice of all the topics in the Learner's Book and is ideal for use in class or as homework. A three-tier, scaffolded approach to skills development promotes visible progress and enables independent learning, ensuring that every learner is supported.

Teachers can assign learners questions from one or more tiers for each exercise, or learners can progress through each of the tiers in the exercise.

Digital Classroom includes digital versions of the Learner's Book and Workbook, complete with pop-up answers, designed for teachers to use at the front of class. Easily share the books with the whole class on your whiteboard, zoom in, highlight and annotate text, and get your learners talking with videos, images and interactive activities.

The Games Book is a supplementary resource designed to encourage learners to apply their mathematical knowledge through games. It consolidates and reinforces learning appropriate to the stage.

A letter to parents, explaining the course, is available to download from Cambridge GO (as part of this Teacher's Resource).

> How to use this Teacher's Resource

This Teacher's Resource contains both general guidance and teaching notes that help you to deliver the content in our Cambridge Primary Mathematics resources. Some of the material is provided as downloadable files, which are available on **Cambridge GO**. (For more information about how to access and use your digital resource, please see the inside front cover.) See the Contents page for details of all the material available to you, both in this book and through Cambridge GO.

Teaching notes

This book provides **teaching notes** for each unit of the Learner's Book and Workbook. Each set of teaching notes contains the following features to help you deliver the unit.

The **Unit plan** summarises the topics covered in the unit, including the number of learning hours recommended for the topic, an outline of the learning content and the Cambridge resources that can be used to deliver the topic.

Topic	Approximate number of learning hours	Outline of learning content	Resources
Hundreds, tens and ones	5	Composing and decomposing three-digit numbers using hundreds, tens and ones; exploring the value of each digit in a 3-digit number.	Learner's Book Section 1.1 Workbook Section 1.1 Additional teaching ideas for Section 1.1 Resource sheet 1A

Cross-unit resources
Diagnostic check and mark scheme
Learner's Book Check your progress
Digital Classroom: Unit 1 multimedia enhancement

The **Background knowledge** feature explains prior knowledge required to access the unit and gives suggestions for addressing any gaps in your learners' prior knowledge.

Learners' prior knowledge can be informally assessed through the **Getting started** feature in the Learner's Book. (See the Assessment for Learning downloadable file section for more information.)

BACKGROUND KNOWLEDGE

This unit extends the learner's understanding of numbers from 100 to 1000. By the end of the unit, learners will recognise the value of each digit in a 3-digit number.

The **Teaching skills focus** feature covers a teaching skill and suggests how to implement it in the unit.

TEACHING SKILLS FOCUS

Manipulatives and images help learners to see the mathematics for themselves. When they make physical changes to a set of objects, learners can see the effect of their actions.

Reflecting the Learner's Book, each unit consists of one or more sections. A section covers a learning topic.

At the start of each section, the **Learning plan** table includes the framework codes, learning objectives and success criteria that are covered in the section.

It is helpful to share learning objectives and success criteria with your learners at the start of a lesson so that they can begin to take responsibility for their own learning. This also helps develop metacognitive skills.

Framework codes	Learning objectives	Success criteria
3Ni.01	• Recite, read and write number names and whole numbers (from 0 to 1000).	• Learners can read and write any 3-digit number, in numbers and words.

The **Language support** feature contains suggestions for how to support learners with English as an additional language. The vocabulary terms and definitions from the Learner's Book are also collected here.

LANGUAGE SUPPORT

Digit: the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. The position of the digit in the number gives its value.

Thousand: the name given to ten hundreds, 1000

There are often **common misconceptions** associated with particular learning topics. These are listed, along with suggestions for identifying evidence of the misconceptions in your class and suggestions for how to overcome them.

Misconception	How to identify	How to overcome
Learners might record numbers with hundreds by writing the hundreds as, for example, 200, followed by the tens and ones. 236 would be recorded as 20036 or 200306.	Ask a learner to write 236 in numbers.	If a learner writes 20036, use place value cards to show how to write 3-digit numbers. Remind them that it is a 3-digit number. The first digit tells you how many hundreds, the second digit tells you how many tens and the third digit tells you how many ones.

For each topic, there is a selection of **starter ideas**, **main teaching ideas** and **plenary ideas**.
You can pick out individual ideas and mix and match them depending on the needs of your class. The activities include suggestions for how they can be differentiated or used for assessment. **Homework ideas** are also provided.

Starter idea

Revisiting the 100 square (10 minutes + 10 minutes Getting started exercise)

Resources: Resource sheet 1C

Description:

Give learners a copy of the 100 square.

Main activity idea

1 to 1000 strip (40 minutes)

Learning intention: Learners will use what they know about 2-digit numbers to begin to extend their understanding to 3-digit numbers.

Resources: Resource sheet 1C, Resource sheet 1A, scissors, sticky tape

The **Cross-curricular links** feature provides suggestions for linking to other areas of the Primary curriculum.

CROSS-CURRICULAR LINKS

Resources in any area may be labelled with how many there are. Science, design technology and art may all have bulk resources labelled in this way. Invite learners to make some comparisons; for example, the number of magnets is less than (<) the number of small dishes.

Thinking and Working Mathematically skills are woven throughout the questions in the Learner's Book and Workbook. These questions, which are indicated by ◄, incorporate specific characteristics that encourage mathematical thinking.

The teaching notes for each unit identify all of these questions and their characteristics. The **Guidance on selected Thinking and Working Mathematically questions** section then looks at one of the questions in detail and provides more guidance about developing the skill that it supports.

Additional teaching notes are provided for the six **NRICH projects** in the Learner's Book, to help you make the most of them.

Projects and their accompanying teacher guidance have been written by the NRICH Team. NRICH is an innovative collaboration between the Faculties of Mathematics and Education at the University of Cambridge, which focuses on problem solving and on creating opportunities for students to learn mathematics through exploration and discussion **https://nrich.maths.org**.

〉 **Digital Classroom:** If you have access to Digital Classroom, these links will suggest when to use the various multimedia enhancements and interactive activities.

PROJECT GUIDANCE: PROJECT 1 SURPRISING SUMS

This guidance accompanies the project in the Learner's Book.

Why do this project?

This task gives learners the opportunity to explore digit sums and spot patterns using the idea of adding the digits of a number. It encourages learners to conjecture by forming questions and ideas about what happens to the digit sums when we add numbers.

Digital resources to download

This Teacher's Resource includes a range of digital materials that you can download from Cambridge GO. (For more information about how to access and use your digital resource, please see the inside front cover.) This icon 📥 indicates material that is available from Cambridge GO.

Helpful documents for planning include:

- **Letter for parents – Introducing the Cambridge Primary and Lower Secondary resources:** a template letter for parents, introducing the Cambridge Primary Mathematics resources.
- **Lesson plan template:** a Word document that you can use for planning your lessons.
  Examples of completed lesson plans are also provided.
- **Curriculum framework correlation:** a table showing how the Cambridge Primary Mathematics resources map to the Cambridge Primary Mathematics curriculum framework.
- **Scheme of work:** a suggested scheme of work that you can use to plan teaching throughout the year.
- **Teaching approaches:** a set of documents providing more detailed information about teaching approaches.

Each unit includes:

- **Additional teaching ideas:** these include an additional starter activity, two main teaching ideas and one plenary idea for each section.
- **Differentiated worksheets:** these worksheets are provided in variations that cater for different abilities. Worksheets labelled 'A' are intended to support less confident learners, worksheets labelled 'B' cater for most learners, and worksheets labelled 'C' are designed to challenge more confident learners. Answer sheets are provided.
- **Language worksheets:** these worksheets provide language support and can be particularly helpful for learners with English as an additional language. Answer sheets are provided.
- **Resource sheets:** these include templates and any other materials that support activities described in the teaching notes.
- **End-of-unit tests:** these provide quick checks of the learner's understanding of the concepts covered in the unit. Answers are provided. Advice on using these tests formatively is given in the Assessment for Learning section of this Teacher's Resource.
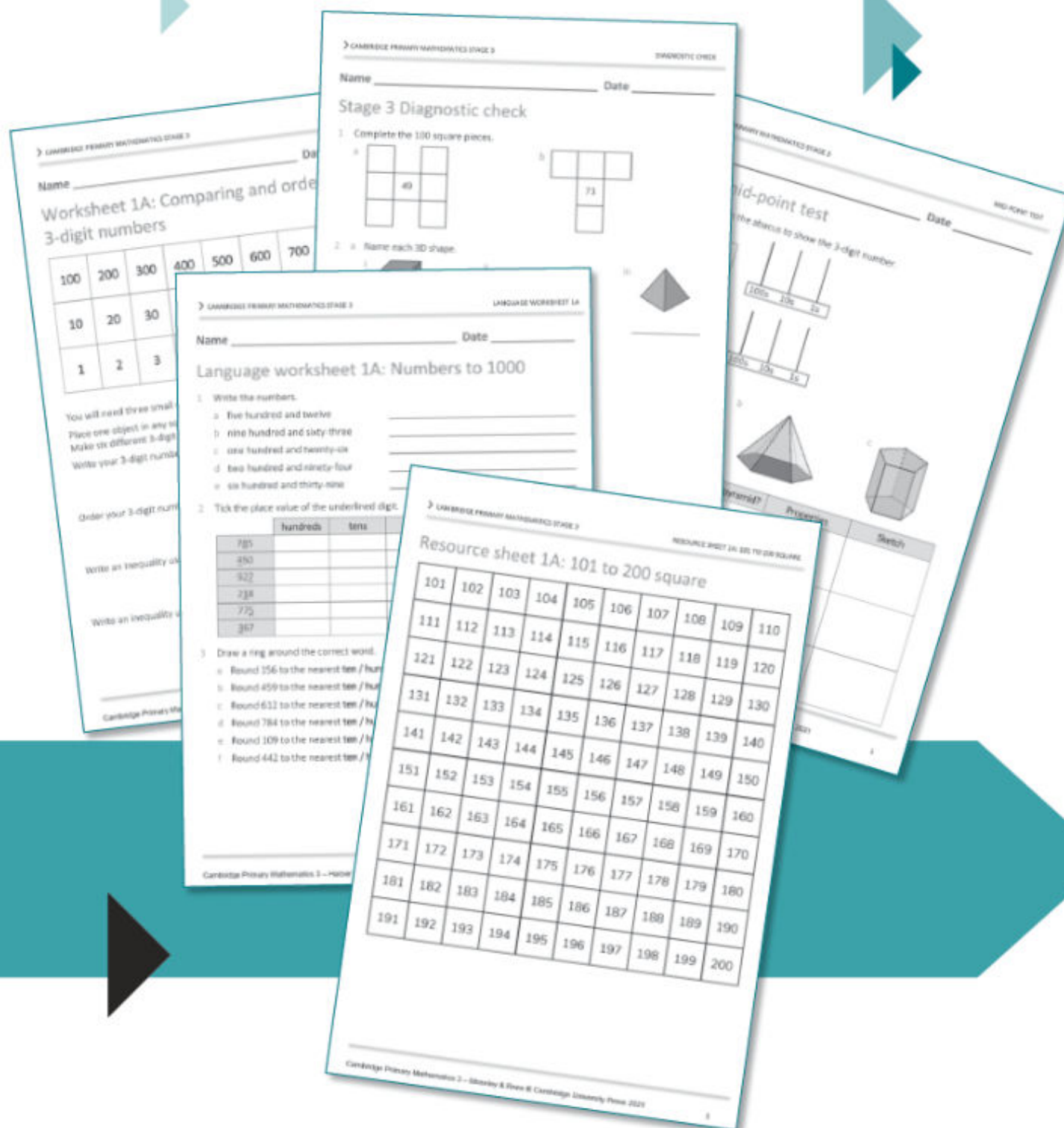
Additionally, the Teacher's Resource includes:

- **Diagnostic check and answers:** a test to use at the beginning of the year to discover the level at which learners are working. The results of this test can inform your planning.
- **Mid-point test and answers:** a test to use after learners have studied half the units in the Learner's Book. You can use this test to check whether there are areas that you need to go over again.
- **End-of-year test and answers:** a test to use after learners have studied all units in the Learner's Book. You can use this test to check whether there are areas that you need to go over again, and to help inform your planning for the next year.

- **Answers to Learner's Book questions**
- **Answers to Workbook questions**
- **Glossary**

Video is available through the Digital Classroom.

〉 About the curriculum framework

The information in this section is based on the Cambridge Primary Mathematics curriculum framework from 2020. You should always refer to the appropriate curriculum framework document for the year of your learners' assessment to confirm the details and for more information.
*Visit **www.cambridgeinternational.org/primary** to find out more.*

The Cambridge Primary Mathematics curriculum framework from 2020 has been designed to encourage the development of mathematical fluency and ensure a deep understanding of key mathematical concepts. There is an emphasis on key skills and strategies for solving mathematical problems and encouraging the communication of mathematical knowledge in written form and through discussion.

At the Primary level, the curriculum framework is divided into three major strands:

- Number
- Geometry and Measure
- Statistics and Probability.

Algebra is introduced as a further strand in the Cambridge Lower Secondary Mathematics curriculum framework.

Underpinning all of these strands is a set of Thinking and Working Mathematically characteristics that will encourage students to interact with concepts and questions. These characteristics are present in questions, activities and projects in this series. For more information, see the Thinking and Working Mathematically section in this resource, or find further information on the Cambridge Assessment International Education website.

A curriculum framework correlation document (mapping the Cambridge Primary Mathematics resources to the learning objectives) and scheme of work are available to download from Cambridge GO (as part of this Teacher's Resource).

$\rangle$ About the assessment

Information concerning the assessment of the Cambridge Primary Mathematics curriculum framework is available on the Cambridge Assessment International Education website
www.cambridgeinternational.org/primary.

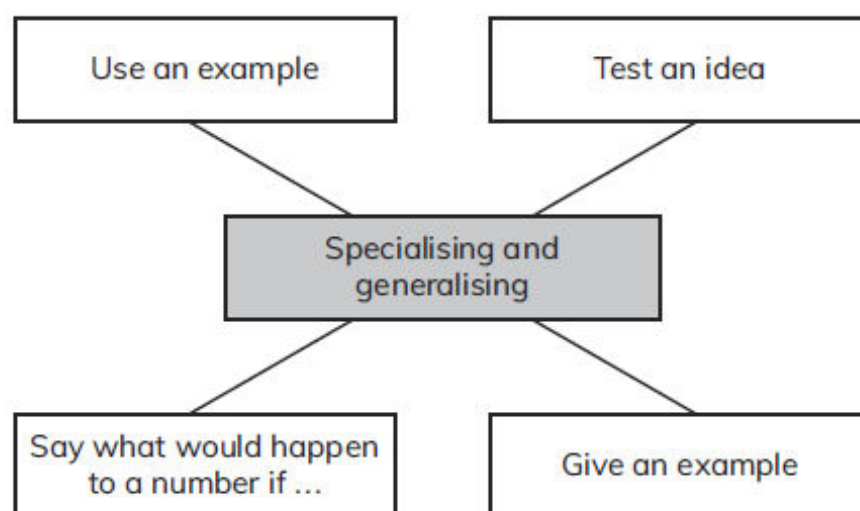# › Introduction to Thinking and Working Mathematically

Thinking and Working Mathematically is an important part of the Cambridge Mathematics course. The curriculum identifies four pairs of linked characteristics: specialising and generalising, conjecturing and convincing, characterising and classifying, and critiquing and improving.

Thinking and Working Mathematically characteristic	Definition
Specialising	Choosing *an example* and checking to see if it satisfies or does not satisfy specific mathematical criteria.
Generalising	Recognising an underlying pattern by identifying *many* examples that satisfy the same mathematical criteria.
Conjecturing	Forming mathematical questions or ideas.
Convincing	Presenting evidence to *justify or challenge* a mathematical idea or solution.
Characterising	Identifying and describing the mathematical properties of an object.
Classifying	Organising objects into groups according to their mathematical properties.
Critiquing	Comparing and evaluating mathematical ideas, representations or solutions to identify advantages and disadvantages.
Improving	Refining mathematical ideas or representations to develop a more effective approach or solution.

There are many opportunities for learners to develop these skills throughout Stage 3. Throughout the exercises in the Learner's Book and the Workbook, we have added this ◁ icon alongside questions that can be used by you with your learners to develop the Thinking and Working Mathematically characteristics. There is a list of these questions and their intended characteristics at the start of each unit of the teaching notes.

This section provides examples of questions that require learners to demonstrate the characteristics, as well as sentence starters to help learners formulate their thoughts. Within the teaching notes for each unit, we have also selected one question from each exercise and provided further guidance on Thinking and Working Mathematically within the context of these questions to help guide and familiarise you with all of the characteristics.

Specialising and generalising

Specialising

Specialising involves choosing and testing or checking an example to see if it satisfies or does not satisfy specific maths criteria. Learners look at specific examples and check to see if they do or do not satisfy specific criteria.

Example 1:

Which fractions could be marked on a number line between $\frac{3}{4}$ and 1?

(Stage 3 Exercise 12.2 question 3)

Learners will show they are **specialising** (TWM.01) when they think of fractions they know and check whether they would sit between $\frac{3}{4}$ and 1 on a number line.

Example 2:

Use your right angle measure to find in your classroom:

- four right angles
- four angles that are greater than a right angle
- four angles that are less than a right angle.

Write and draw the angles that you found.

(Stage 3 Exercise 15.1 question 2)

Learners will show they are **specialising** (TWM.01) when they check angles against their right angle measure to identify which are right angles, which are larger than right angles and which are smaller than right angles.

SENTENCE STARTERS

- I could try …
- … is the only one that …
- … does not work because …
- It must be … because …

Generalising

Generalising involves recognising a wider pattern by identifying many examples that satisfy the same maths criteria. Learners make connections between, for example, numbers and shapes, and use these to form rules or patterns.

Example 1:

Tomas makes nine 3-digit numbers using a set of place value cards. Seven of the numbers are 473, 689, 358, 134, 925, 247 and 791. What could the other two numbers be?

(Stage 3 Exercise 1.1 Think like a mathematician)

Learners will show they are **generalising** (TWM.02) when they eliminate the place value cards that have been used and identify those that can be used to make two more numbers: 2, 6, 10, 60, 500 and 800. There are several different solutions.

Example 2:

Explain what happens to a single-digit number and a 2-digit number when it is multiplied by 10.
You could use the place value chart to help you.

100s	10s	1s

(Stage 3 Exercise 5.1 question 7)

Learners will show they are **generalising** (TWM.02) when they recognise the underlying pattern (each one becomes a ten and every ten becomes a one hundred so the whole number is ten times bigger) and identify multiple examples to illustrate the pattern.