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Primary Mathematics

Teacher's Resource 4

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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 inside the front cover.

Active learning

Assessment for Learning

Developing learners' language skills

Differentiation

Improving learning through questioning

Language awareness

Metacognition

Skills for Life

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 with teacher notes and learner self-assessment sheet

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

End-of-unit tests and answers

> 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, including Digital Classroom which lets you share books with your class and play videos and audio. This Teacher's Resource also offers additional materials available to download from Cambridge GO. (For more information on how to access and use your digital resource, please see inside the 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

Mary Wood



Mary enjoys travelling and finding mathematics around her, including tile patterns on the roofs of churches and other buildings to the 'fat policeman' in Budapest, Hungary. His belt has the number 235 on it and 2, 3, 5 are the first three prime numbers.

Mary has a wealth of mathematical experience from an education career spanning over forty years. Following many years of classroom teaching, she has worked in educational consultancy and continuing professional development in the United Kingdom and overseas. Mary is an experienced examiner, which has allowed her to better understand the needs of teachers and students working in varied contexts. She enjoys writing and editing primary mathematics books.

Emma Low



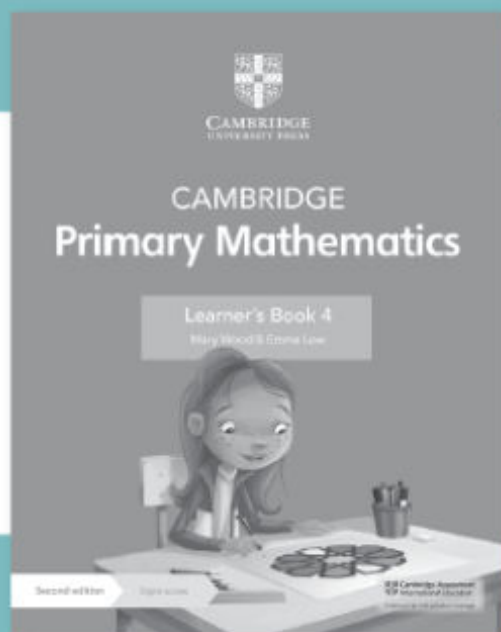
Emma graduated from the University of London with a BA(Ed) in Education with Mathematics and Computer Studies and holds a MEd in Mathematics Education from the University of Cambridge. Within her Masters degree she studied a variety of international education systems and strategies which she uses in her teaching and writing.

Emma was a primary school teacher and Mathematics and ICT Leader, then became a Mathematics Consultant for the Local Authority, supporting schools through professional development and authoring publications. Emma has also taught secondary mathematics at an Outstanding comprehensive school.

Since 2010 Emma has been a freelance consultant and writer. She provides engaging and inspiring professional development, and supports effective and creative planning, teaching and assessment. Emma has written professional development materials as an associate of the National Centre for Excellence in the Teaching of Mathematics (NCETM). She has authored many mathematics textbooks, teachers' guides, mathematical games and activity books.

> How to use this series

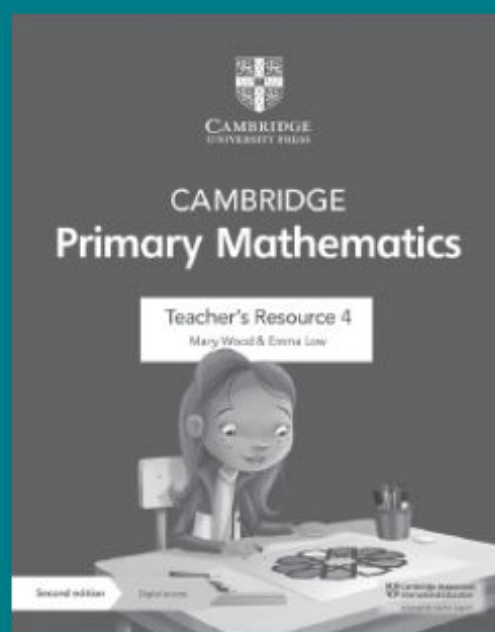
All of the components in the series are designed to work together.

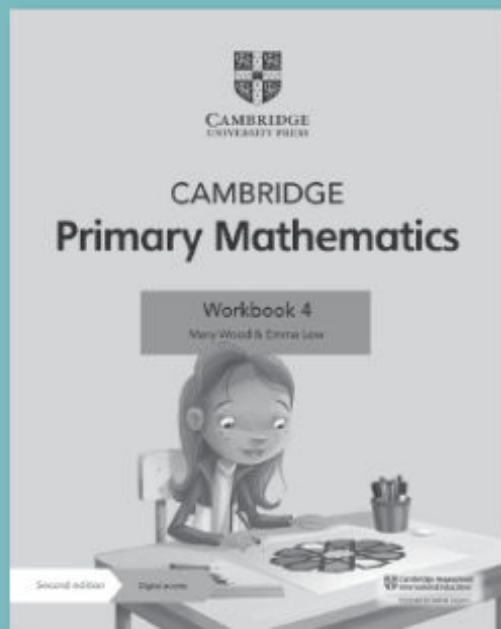


The Learner's Book is designed for learners to use in class with guidance from the teacher. It offers complete coverage of the curriculum framework. A variety of investigations, activities, questions and images motivate learners and help them to develop the necessary mathematical skills. Each unit contains 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 teaching guidance, downloadable worksheets and more.

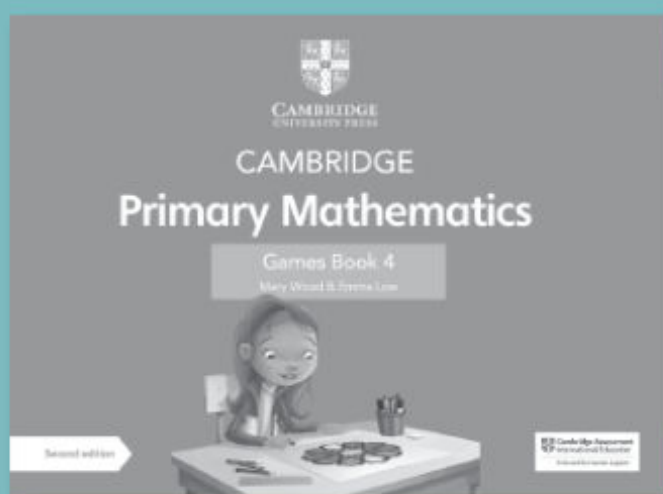
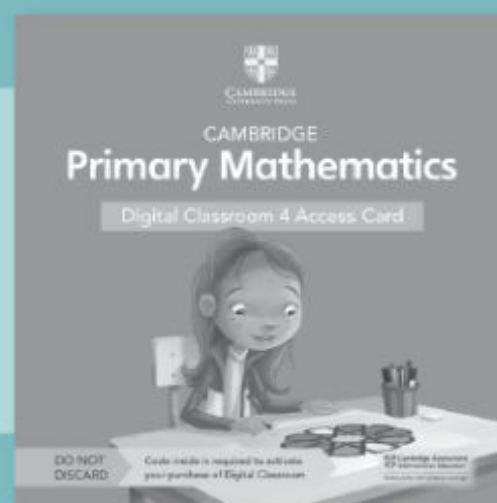





The skills-focused write-in Workbook provides further practice of all the topics in the Learner's Book and is ideal for use in class or as homework. A three-tier, scaffolded approach to skills development promotes visible progress and enables independent learning, ensuring that every learner is supported.

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, available on **Cambridge GO**. (For more information about how to access and use your digital resource, please see inside the 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
1.1 Counting and sequences	4	Count forwards and backwards including negative numbers. Recognise linear sequences.	Learner's Book Section 1.1 Workbook Section 1.1 Additional teaching ideas for Section 1.1
Cross-unit resources			
Diagnostic check and mark scheme Learner's Book Check your progress Digital Classroom: Unit 1 slideshow Digital Classroom: Unit 1 activity			

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

Before starting this unit, you may want to use the diagnostic check to ensure that learners are ready to begin Stage 4. The diagnostic check can help you to identify gaps in learners' knowledge or understanding, which you can help them address before beginning this unit.

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

TEACHING SKILLS FOCUS

Investigations

'Think like a mathematician' activities allow learners to explore mathematical topics. When learners say they are stuck, it is easy for teachers to give too much help. This section encourages you to stand back, watch and listen but not intervene unless absolutely necessary.

Reflecting the Learner's Book, each unit consists of multiple 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.

LEARNING PLAN		
Framework codes	Learning objectives	Success criteria
4Nc.01	<ul style="list-style-type: none"> Count on and back in steps of constant size. 	<ul style="list-style-type: none"> Learners can count on and back in steps of tens, hundreds and thousands.

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

A negative number is written with a minus sign in front, for example -7 . It is read as 'negative seven' not 'minus seven'. 'Minus 7' is an instruction to subtract 7. It might be helpful to display a definition and example for learners to refer to.

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 may use incorrect language; minus 1 instead of negative 1 when counting.	Listen to learners counting.	Always use correct language and correct any incorrect terminology.

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

Getting started (20 minutes)

Resources: Unit 1 Getting started exercise in the Learner's Book.

Description: Give learners 10 minutes to answer the Getting started questions in their exercise books.

Main teaching idea

Exploring stick patterns (20–30 minutes)


Learning intention: Recognise and extend sequences; describe term-to-term rule for a sequence.

Resources: sticks, Resource sheet 1A Stick patterns, (optional) Stick patterns digital manipulative in Digital Classroom C.

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

CROSS-CURRICULAR LINKS

When working with temperatures there are many opportunities to address issues related to climate and climate change.

Thinking and Working Mathematically skills are woven throughout the questions in the Learner's Book and Workbook. These questions, 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.

Guidance on selected *Thinking and Working Mathematically* questions

Learner's Book Exercise 1.1, questions 2 and 3

Question 2 is a 'compare and contrast' activity; it addresses **generalising (TWM.02)** (what is the same about two sequences) and **specialising (TWM.01)** (testing the sequences to see if they fit the generalisation).



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. www.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 DEEP WATER

Why do this project?

This task is designed to help learners gain familiarity with negative numbers on a number line. It gives them the opportunity to explore calculating with negative numbers in a context that will boost their confidence. Conversations with other learners and adults will help learners develop the skills of **critiquing** and **improving** by encouraging them to compare different ways of finding solutions and to refine their own explanations.

Digital resources to download

This Teacher's Resource includes a range of digital materials that you can download 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 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.
- **Scheme of work:** a suggested scheme of work that you can use to plan teaching throughout the year.
- a set of documents providing more detailed information about teaching approaches.

Each unit includes:

- **Additional teaching ideas:** additional starter, main and plenary activity ideas are provided for each section in the unit.
- **Differentiated worksheets:** these worksheets are provided in variations that cater for different abilities. Worksheets labelled 'A' are intended to support less confident learners, while worksheets labelled 'B' 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 additional activities given 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 downloadable file in this Teacher's Resource.

Additionally, the Teacher's Resource includes:

- **Diagnostic check with teacher notes and learner self-assessment sheet:** a test to use at the beginning of the year to work out the level that learners are working at. The results of this test can inform your planning.
- **Mid-point test and mark scheme:** a test to use after learners have studied Units 1–9 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 mark scheme:** 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**

In addition, you can find more detailed information about teaching approaches.



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 (0096) 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, it 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 learners to interact with concepts and questions. These characteristics are present in questions, activities and projects in this series. For more information, see the *Introduction to 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).


> 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

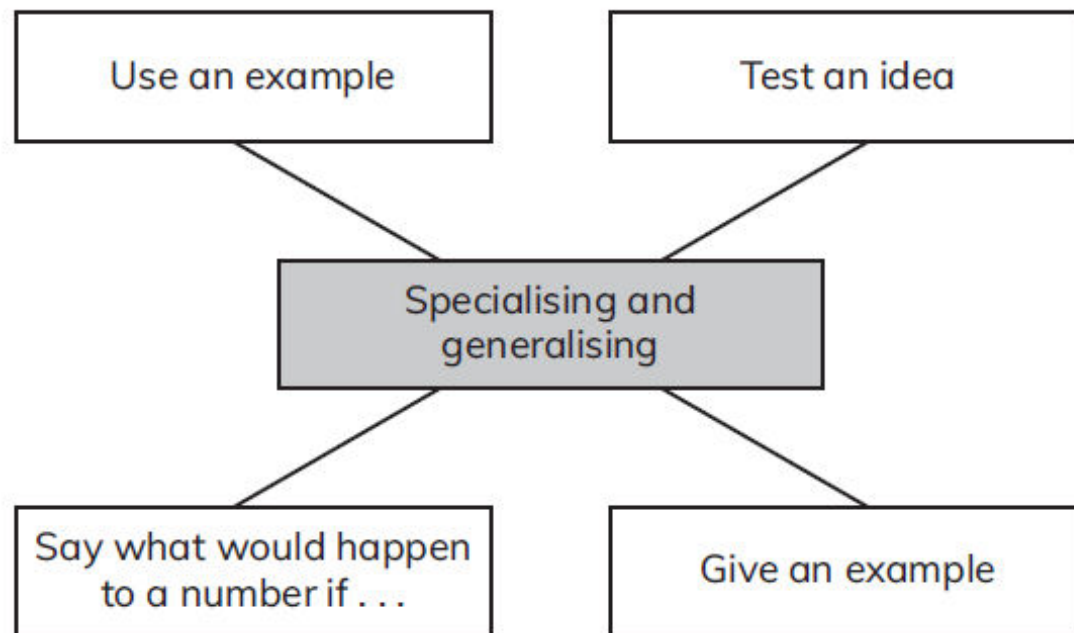
Thinking and working mathematically is an important part of the Cambridge Primary Mathematics course. The curriculum identifies four pairs of linked characteristics: specialising and generalising, conjecturing and convincing, characterising and classifying, and critiquing and improving.

Thinking and Working Mathematically characteristic	Definition
Specialising	Choosing <i>an example</i> and checking to see if it satisfies or does not satisfy specific mathematical criteria
Generalising	Recognising an underlying pattern by identifying <i>many</i> examples that satisfy the same mathematical criteria
Conjecturing	Forming mathematical questions or ideas
Convincing	Presenting evidence to <i>justify or challenge</i> 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 4. 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 in the teaching notes for each unit.

This section provides examples of questions that require learners to demonstrate the Thinking and Working Mathematically characteristics, along with 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 the question to help familiarise you with all of the characteristics.

Specialising and generalising



Specialising

Specialising involves choosing and testing 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:

Find a fraction that could go in the box. $\frac{1}{3} < \square < \frac{2}{3}$

Learners show they are **specialising (TWM.01)** when they choose examples of fractions and check to see whether the answer is correct, for example $\frac{1}{2} = \frac{3}{6}$ which lies between $\frac{2}{6}$ and $\frac{4}{6}$

SENTENCE STARTERS

- I could try . . .
- . . . is the only one that . . .
- . . . is the only one that does not . . .

Generalising

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

Example:

Put this set of numbers in order starting with the smallest.

-6 6 12 -12 0 -18

Describe the number pattern.

The pattern continues in the same way.

Will 121 be in the pattern? How do you know?

Learners will show they are **generalising (TWM.02)** when they notice that all of the numbers in the sequence divide exactly by 6 but 121 does not. Alternatively, they could notice that the numbers are all even, but 121 is odd.

SENTENCE STARTERS

- I found the pattern . . . so . . .

Conjecturing and convincing

