

# CAMBRIDGE PRIMARY Mathematics



## Teacher's Resource

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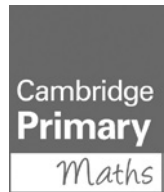
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# The Ethos of the *Cambridge Primary Maths* project



*Cambridge Primary Maths* is an innovative combination of curriculum and resources designed to support teachers and learners to succeed in primary mathematics through best-practice international maths teaching and a problem-solving approach.

*Cambridge Primary Maths* brings together the world-class Cambridge Primary mathematics curriculum from **Cambridge International Examinations**, high-quality publishing from **Cambridge University Press** and expertise in engaging online eFment materials for the mathematics curriculum from **NRICH**.

*Cambridge Primary Maths* offers teachers an online tool that maps resources and links to materials offered through the primary mathematics curriculum, NRICH and Cambridge Primary Mathematics textbooks and e-books. These resources include engaging online activities, best-practice guidance and examples of *Cambridge Primary Maths* in action.

The Cambridge curriculum is dedicated to helping schools develop learners who are confident, responsible, reflective, innovative and engaged. It is designed to give learners the skills to problem solve effectively, apply mathematical knowledge and develop a holistic understanding of the subject.

The Cambridge University Press series of *Teacher's Resource* printed books and CD-ROMs provide best-in-class support for this problem-solving approach, based on pedagogical practice found in successful schools across the world. The engaging NRICH online resources help develop mathematical thinking and problem-solving skills.

The benefits of being part of *Cambridge Primary Maths* are:

- the opportunity to explore a maths curriculum founded on the values of the University of Cambridge and best practice in schools
- access to an innovative package of online and print resources that can help bring the Cambridge Primary mathematics curriculum to life in the classroom.

To get involved visit [www.cie.org.uk/cambridgeprimarymaths](http://www.cie.org.uk/cambridgeprimarymaths)

- 1 You can explore the available resources on the *Cambridge Primary Maths* website by curriculum framework, scheme of work, or teacher resources. In this example, the 'Teacher resources' tab has been selected.
- 2 The drop-down menu allows selection of resources by Stage.
- 3 Following selection of the 'Teacher resource' and 'Stage 1', the chapters in the Cambridge University Press textbook '*Teacher's resource 1*' are listed.
- 4 Clicking on a chapter ('2 Playing with 10' in this example) reveals the list of curriculum framework objectives covered in that chapter. Clicking on a given objective (1Nc1 in this example) highlights the most relevant NRICH activity for that objective.
- 5 A list of relevant NRICH activities for the selected chapter are revealed. Clicking on a given NRICH activity will highlight the objectives that it covers. You can launch the NRICH activity from here.

The *Cambridge Primary Maths* project provides a complete support package for teachers. The *Teacher's Resource* is a standalone teaching textbook that can be used independently or together with *Cambridge Primary Maths* website. The free to access website maps the activities and games in the *Teacher's Resource* to the Cambridge Primary curriculum. It also highlights relevant online activities designed by the NRICH project team based at the University of Cambridge.

The additional material that the *Cambridge Primary Maths* project provides can be accessed in the following ways:

**As a Cambridge Centre:**

If you are a registered Cambridge Centre, you get free access to all the available material by logging in using your existing Cambridge International Examinations log in details.

**Register as a visitor:**

If you are not a registered Cambridge Centre you can register to the site as a visitor, where you will be free to download a limited set of resources and online activities that can be searched by topic and learning objective.

**As an unregistered visitor:**

You are given free access an introductory video and some sample resources, and are able to read all about the scheme.

# Introduction

The *Cambridge Primary Maths* series of resources covers the entire content of the Cambridge Primary Mathematics curriculum framework from Cambridge International Examinations. The resources have been written based on a suggested teaching year of three, ten week terms. This can be amended to suit the number of weeks available in your school year.

The Cambridge Primary Mathematics framework provides a comprehensive set of learning objectives for mathematics. These objectives deal with what learners should know and be able to do. The framework is presented in five strands: the four content strands of Number (including mental strategies), Geometry, Measures and Handling Data are all underpinned by the fifth strand, Problem Solving. Problem solving is integrated throughout the four content strands. Whilst it is important to be able to identify the progression of objectives through the curriculum, it is also essential to bring together the different strands into a logical whole.

This series of printed books and CD-ROMs published by Cambridge University Press is arranged to ensure that the curriculum is covered whilst allowing teachers flexibility in approach. The Scheme of Work for Stage 4 has been fully covered and follows in the same ‘Unit’ order as presented by Cambridge International Examinations (1A–C, 2A–C and then 3A–C) but the order of objective coverage may vary depending on a logical pedagogy and teaching approach.

The components of the printed series are as follows:

- *Teacher’s Resource* (printed book and CD-ROM)  
This resource covers all the objectives of the Cambridge framework through lessons referred to as ‘*Core activities*’. As a ‘lesson’ is a subjective term (taking more or less time depending on the school and the learners) we prefer to use the terms ‘*Core activity*’ and ‘session’ to reinforce that there is some flexibility. Each *Core activity* contains the instructions for you to lead the activity and cover the objectives, as well as providing expected outcomes, suggested dialogue for discussion, and likely areas

of misconception. A section called ‘*More activities*’ provides you with suggestions for supplementary or extension activities.

The *Teacher’s Resource* can be used on its own to **completely cover** the course. (The *Learner’s Book* and *Games Book* should **not** be used without the associated teacher resource, as they are not sufficient on their own to cover all the objectives.)

The accompanying CD-ROM contains:

- a Word version of the entire printed book. This has been supplied so that you can copy and paste relevant chunks of the text into your own lesson plans if you do not want to use our book directly. You will be able to edit and print the Word files as required but different versions of Word used on different PCs and MACs will render the content slightly differently so you might have some formatting issues.
- *Questioning* – This document outlines some of the different types of question techniques for mathematics and how best to use them, providing support for teachers.
- *Letters for parents* – a template letter is supplied along with a mapping grid to help you to write a letter per Unit of material in order to inform parents what work their child is doing, and what they can do to support their child at home.
- *Photocopy masters* – resources are supplied as PDFs, and as Word files so that you can edit them as required.

- *Learner’s Book* (printed book)  
This resource is **supplementary** to the course. As the ethos of the *Cambridge Maths Project* is to avoid rote learning and drill practice, there are no accompanying write-in workbooks. The *Learner’s Book* instead combines consolidation and support for the learner with investigations that allow freedom of thought, and questions that encourage the learner to apply their knowledge rather than just remembering a technique. The investigations and questions are written

to assess the learner's understanding of the learning outcomes of the *Core activity*. Learners can write down their answers to investigations and questions in an exercise book in order to inform assessment. The overall approach of the *Teacher's Resource* accompanied by the *Learner's Book* allows a simple way for you to assess how well a learner understands a topic, whilst also encouraging discussion, problem-solving and investigation skills.

At Stage 4, each *Learner's Book* page is designed to help learners to consolidate and apply knowledge. Each section associated with a *Core activity* starts with an introductory investigation called “*Let's investigate*”, which is an open-ended question to get the learners thinking and investigating. These are often ‘low threshold, high ceiling’ so that learners can approach the question at many levels. This is followed by a series of questions and/or activities to develop problem-solving skills and support learning through discovery and discussion. New vocabulary is explained, and where possible this is done using illustrations as well as text in order to help visual learners and those with lower literacy levels. Hints and tips provide direct support throughout. Ideally, the session should be taught using the appropriate *Core activity* in the *Teacher's Resource* with the *Learner's Book* being used at the end of the session, or set as homework, to consolidate learning.

There is generally a double page in the *Learner's Book* for each associated *Core activity* in the *Teacher's Resource* for Stage 4. The *Teacher's Resource* will refer to the *Learner's Book* page by title and page number, and the title of the *Core activity* will be at the bottom of the *Learner's Book* page. **Please note** that the *Learner's Book* does not cover all of the Cambridge objectives on its own; it is for supplementary use only.

- *Games Book* (printed book and CD-ROM)  
This resource is complete in its own right as a source of engaging, informative maths games. It is also a **supplementary** resource to the

series. It can be used alongside the *Teacher's Resource* as a source of additional activities to support learners that need extra reinforcement, or to give to advanced learners as extension. Each game comes with a ‘*Maths focus*’ to highlight the intended learning/reinforcement outcome of the game, so that the book can be used independently of any other resource. For those who are using it as part of this series, relevant games are referred to by title and page number in the ‘*More activities*’ section of the *Teacher's Resource*. The accompanying CD-ROM contains nets to make required resources; it also contains a mapping document that maps the games to the other resources in the series for those who require it. **Please note** that the *Games Book* does not cover all of the Cambridge objectives on its own; it is for supplementary use only.

### **Each chapter in the Teacher's Resource includes**

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- A *Quick reference* section to list the title of each of the *Core activities* contained within the chapter. It provides an outline of the learning outcome(s) of each *Core activity*. (See page vii and later in this list, for a reminder of what is meant by a *Core activity*.)
- A list of the *Objectives* from the Cambridge Primary Mathematics curriculum framework that are covered across the chapter as a whole. **Please note** that this means that not all of the listed objectives will be covered in each of the chapter's *Core activities*; they are covered when the chapter is taken as a whole. The objectives are referenced using sub-headings from the framework, for example ‘**1A: Calculation** (*Mental strategies*)’ and the code from the Scheme of Work, for example, ‘2Nc3’.

Please be aware that the content of an objective is often split across different *Core activities* and/or different chapters for a logical progression of learning and development. Please be assured that provided you eventually cover all of the *Core activities* across the whole *Teacher's Resource*, you will have covered all of the objectives in full. It should be clear from the nature of a *Core activity* when parts of an objective have not been fully covered. For example, a chapter on length



will list ‘Measure’ objectives that also include weight, such as ‘1MI1’ (Compare lengths and weights by direct comparison...) but the weight aspect of the objective will not be covered in a chapter on length(!); that part of the objective will be covered in a chapter on weight. Or a chapter focussing on understanding teen numbers as ‘ten and some more’ might cover the action ‘recite numbers in order’ but only up to 20 and therefore only partially cover objective ‘1Nn1’ (Recite numbers in order ... from 1 to 100...). But please be reassured that, by the end of the *Teacher’s Resource*, all of objectives 1MI1 and 1Nn1 will have been covered in full; as will all objectives. The *Summary* bulleted list at the end of each *Core activity* lists the learning outcome of the activity and can add some clarity of coverage, if required.

- A list of key *Prior learning* topics is provided to ensure learners are ready to move on to the chapter, and to remind teachers of the need to build on previous learning.
- Important and/or new *Vocabulary* for the chapter as a whole is listed. Within the *Core activity* itself, relevant vocabulary will be repeated along with a helpful description to support teaching of new words.

The *Core activities* (within each chapter) collectively provide a comprehensive teaching programme for the whole stage. Each *Core activity* includes:

- A list of required *Resources* to carry out the activity. This list includes resources provided as photocopy masters within the *Teacher’s Resource* printed book (indicated by ‘(pxx)’), and photocopy masters provided on the CD-ROM (indicated by ‘(CD-ROM)’), as well as resources found in the classroom or at home. ‘(Optional)’ resources are those that are required for the activities listed in the ‘*More activities*’ section and thus are optional.
- A main narrative that is split into two columns. The left-hand (wider) column provides instructions for how to deliver the activity, suggestions for dialogue to instigate discussions, possible responses and outcomes, as well as general support for teaching the objective. Differences in formatting in this section identify different types of interactivity:

- Teacher-led whole class activity  
The main narrative represents work to be done as a whole class.
- Teacher-Learner discussion  
“*Text that is set in italics within double-quotation marks represents suggested teacher dialogue to instigate Teacher-Learner discussion.*”
- Learner-Learner interaction

Group and pair work between learners is encouraged throughout and is indicated using a grey panel behind the text and a change in font.

The right-hand (narrow) column provides,

- the vocabulary panel
- side-notes and examples
- a *Look out for!* panel that offers practical suggestions for identifying and addressing common difficulties and misconceptions, as well as how to spot advanced learners and ideas for extension tasks to give them
- an *Opportunity for display* panel to provide ideas for displays.
- A *Summary* at the end of each *Core activity* to list the learning outcomes/expectations following the activity. This is accompanied by a *Check up!* section that provides quick-fire probing questions useful for formative assessment; and a *Notes on the Learner’s Book* section that references the title and page number of the associated *Learner’s Book* page, as well as a brief summary of what the page involves.
- A *More activities* section that provides suggestions for further activities; these are not required to cover the objectives and therefore are optional activities that can be used for reinforcement and differentiation. The additional activities might include a reference to a game in the *Games Book*. You are encouraged to also look on the *Cambridge Maths Project* website to find NRich activities linked to the Cambridge objectives. Together, these activities provide a wealth of material from which teachers can select those most appropriate to their circumstances both in class and for use of homework if this is set.

We would recommend that you work through the chapters in the order they appear in this book as you might find that later chapters build on knowledge from earlier in the book. If possible, work with colleagues and share ideas and over time you will feel confident in modifying and adapting your plans.

## Teaching approaches

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Learners have different learning styles and teachers need to appeal to all these styles. You will find references to group work, working in pairs and working individually within these materials.

The grouping depends on the activity and the point reached within a series of sessions. It may be appropriate to teach the whole class, for example, at the beginning of a series of sessions when explaining, demonstrating or asking questions. After this initial stage, learners often benefit from opportunities to discuss and explain their thoughts to a partner or in a group. Such activities where learners are working collaboratively are highlighted in the main narrative as detailed in the previous section. High quality teaching is oral, interactive and lively and is a two-way process between teacher and learners. Learners play an active part by asking and answering questions, contributing to discussions and explaining and demonstrating their methods to the rest of the class or group. Teachers need to listen and use learner ideas to show that these are valued. Learners will make errors if they take risks but these are an important part of the learning process.

## Talking mathematics

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We need to encourage learners to speak during a maths session in order to:

- communicate
- explain and try out ideas
- develop correct use of mathematical vocabulary
- develop mathematical thinking.

It is important that learners develop mathematical language and communication in order to (using Bloom's taxonomy):

- Explain mathematical thinking (I think that ... because ...)
- Develop understanding (I understand that ...)
- Solve problems (I know that ... so ...)
- Explain solutions (This is how I found out that ...)
- Ask and answer questions (What, why, how, when, if ...)
- Justify answers (I think this because ...)

There is advice on the CD-ROM about the types of questioning you can use to get your students talking maths (*Questioning*).

## Resources, including games

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Resources can support, assist and extend learning. The use of resources such as *Ten frames*, *100 squares*, *number lines*, *digit cards* and *arrow cards* is promoted in the *Teacher's Resource*. Games provide a useful way of reinforcing skills and practising and consolidating ideas. Learners gain confidence and are able to explore and discuss mathematical ideas whilst developing their mathematical language.

Calculators should be used to help learners understand numbers and the number system including place value and properties of numbers. However, the calculator is not promoted as a calculation tool before Stage 5.

NRICH have created an abundance of engaging and well-thought-out mathematical resources, which have been mapped to the Cambridge Primary scheme of work, and are available from the *Cambridge Primary Maths* website. Their interactive and downloadable activities can provide an alternative learning style or enrichment for some of the core concepts.