CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE Primary Mathematics

Teacher's Resource 2

Cherri Moseley & Janet Rees

Second edition

Digital access

Cambridge Assessment International Education

Endorsed for teacher support

CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE
Primary Mathematics

Teacher's Resource 2

Cherri Moseley & Janet Rees

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781108783873

First published 2014
Second edition 2021

20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Printed in 'country' by 'printer'

A catalogue record for this publication is available from the British Library

ISBN 9781108783873 Paperback with Digital Access

Additional resources for this publication at www.cambridge.org/9781108783873

Contents

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 front cover.

Active learning

Assessment for Learning

Developing learner language skills

Differentiation

Improving learning through questioning

Language awareness

Metacognition

Skills for Life

Letter for parents – Using the Cambridge Primary resources

Lesson plan template

Curriculum framework correlation

Scheme of work

Diagnostic check and answers

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 and now includes pages from the Learner's Book.

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 front cover.)

The series uses the most successful teaching pedagogies 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 intentions 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 number 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.

Twice she 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 also 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.

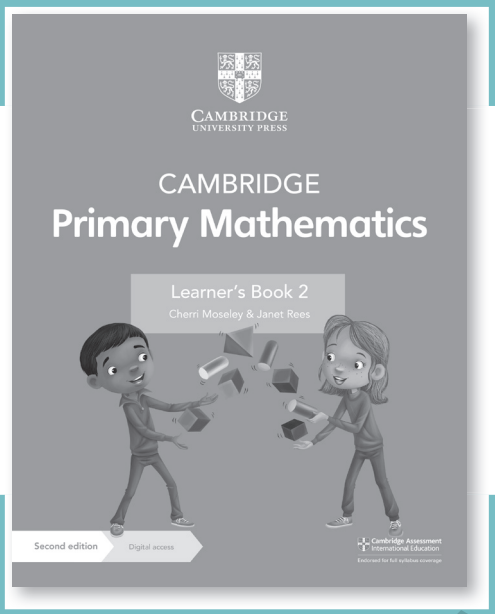
Janet Rees

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 in both mainstream and special schools. This has included training and writing, 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

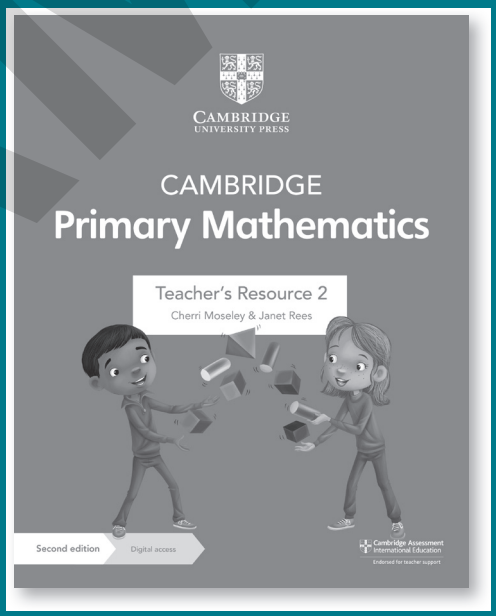
All of the components in the series are designed to work together.

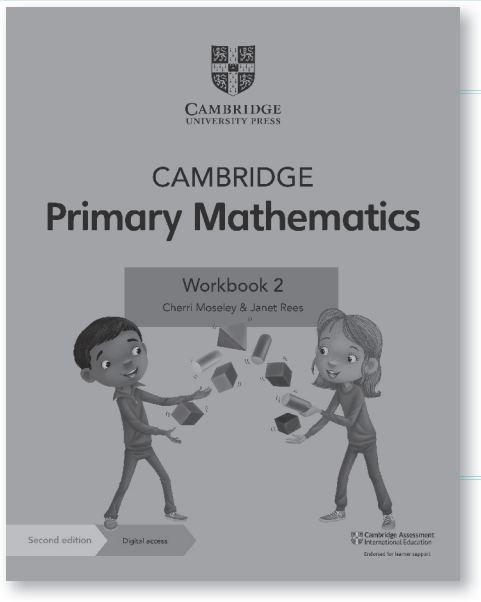


The Learner's Book is designed for learners to use in class with guidance from the teacher. It offers complete coverage of the curriculum framework. A variety of investigations, activities, questions and images motivate learners and help them to develop the necessary mathematical skills. Each unit contains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





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.

DC access card cover

Games Book cover

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 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 Numbers to 100	5	Recite, read and write numbers to 100, recognising the value of each digit.	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 video: Numbers all around you: 20–100 **Digital Classroom:** Digital manipulative: Interactive 100 square			

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 make sure that learners are ready to begin Stage 2. 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

Manipulatives

Using manipulatives allows 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 multiple sections. A section covers a learning topic.

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

It is helpful to share learning intentions 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
2Ni.01	• Recite, read and write number names and whole numbers (from 0 to 100).	• Learners can recite, read and write numbers from 0 to 100.

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

Column: arrangement of numbers or objects in a line, running up and down the page or surface

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

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 confuse the order of the tens numbers.	Ask learners to count on in ones from 45 (or a similar number) into the next ten.	Count in multiples of 10, from 10 to 100 to recall the order. Use a 100 square or number line for support when counting in ones or tens.

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

What do you know about number 17? (10 minutes + 10 minutes Getting started exercise)

Resources: Mini whiteboards and pens; place value cards to 20 (Resource sheet 1A); ten frames (Resource sheet 1E) and counting objects; 0–20 number line (Resource sheet 1B).

Main teaching idea

To 100 (40 minutes)

Learning intention: Learners recite and read numbers from 0 to 100. Learners begin to recognise the value of each **digit** in a 2-digit number, including 0 as a **place holder**. They compose and decompose 2-digit numbers using tens and ones.

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

CROSS-CURRICULAR LINKS

Numbers are used in many areas of the curriculum. Ask learners to look out for those used in measuring, particularly in science, design and technology.

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 Section 1.1, Let's investigate after question 3

The questions prompt learners to look for similarities and differences in the rows of a 100 square. Ask learners to make an initial **conjecture** (TWM.03) and then check whether or not their conjecture is true by looking at further rows to **convince** (TWM.04) themselves.

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**.

PROJECT GUIDANCE: PROJECT 1 POSSIBLY ODD

Why do this problem?

This task deepens learners' understanding of odd (and even) numbers, and offers practice in comparing numbers. By challenging them to articulate a way that will always find a solution, learners will have the opportunity to refine their approaches and eventually to **generalise** (TWM.02) their strategy. This project relates to the learning objective 2Nc.05 (Recognise the characteristics of even and odd numbers (from 0 to 100)).

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

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 – Using 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.

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 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.

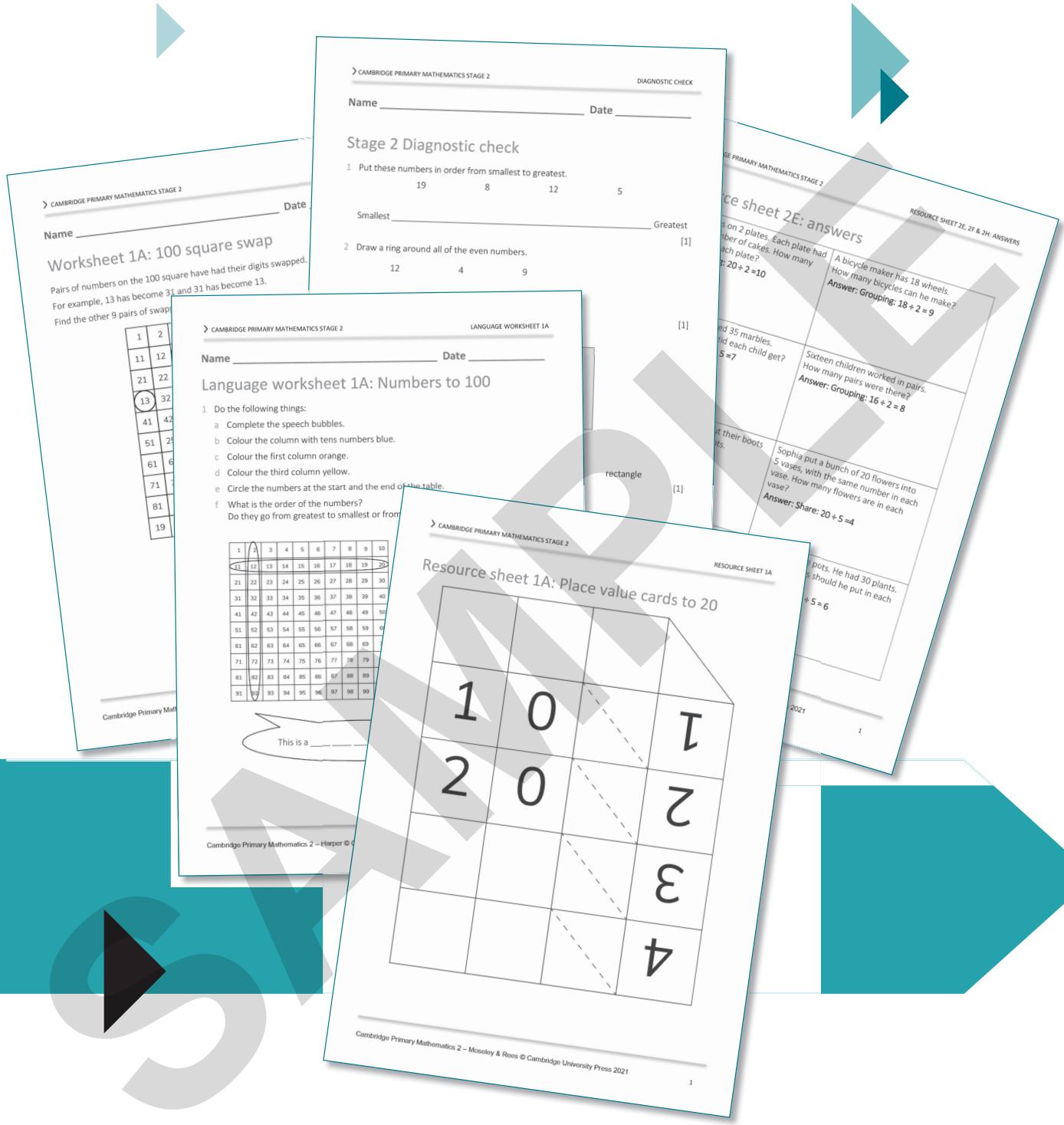
Additionally, the Teacher's Resource includes:

- **Diagnostic check and mark scheme:** a test to use at the beginning of the year to discover the level that learners are working at. The results of this test can inform your planning.
- **Mid-year test and mark scheme:** 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 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.

Audio is available for download from Cambridge GO (as part of this Teacher's Resource and as part of the digital resources for the Learner's Book and Workbook).

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' examination 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 toThinking 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).

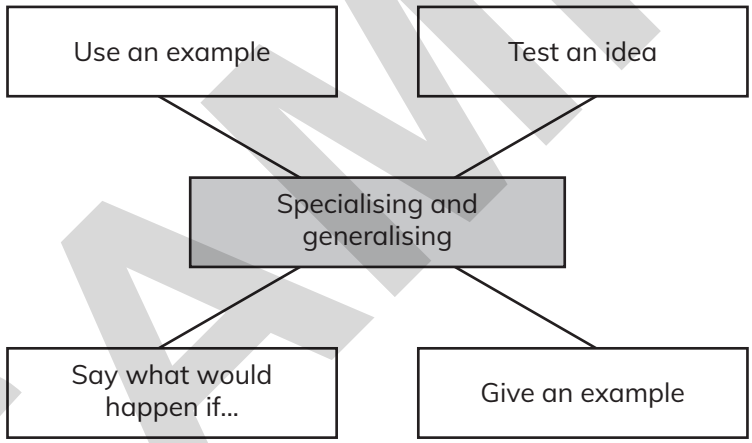
About the assessment

Information concerning the assessment of the Cambridge Primary Mathematics curriculum framework is available on the Cambridge Assessment International Education website: **www.cambridgeassessment.org**

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. There are many opportunities for learners to develop these skills throughout Stage 2. This section provides examples of questions that require learners to demonstrate the characteristics, along with sentence starters to help learners formulate their thoughts.

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:

Show that $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent using numbers.

Learners show they are **specialising** when they choose a value for the whole and find half of the whole. They then need to find the value of $\frac{2}{4}$ of the same whole to show that $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent, that is, equal in value.

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 shapes and use these to form rules or patterns.

Example:

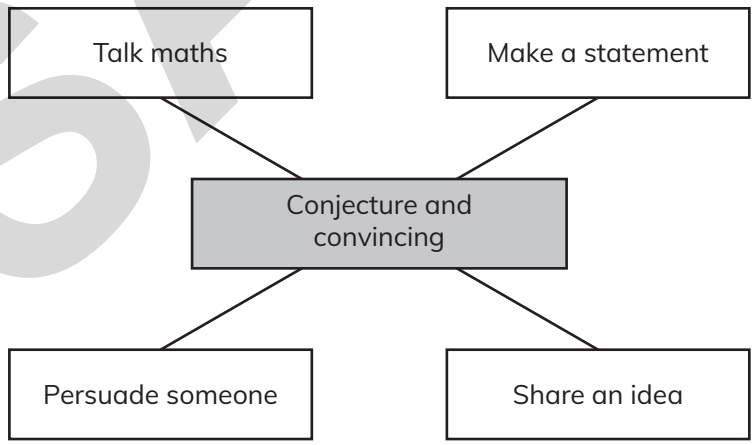
6 + 4 = 10. Use this to help you write two complements amend to of, as in curriculum objectives 20 and one complement of 100.

Learners show they are **generalising** when they add 10 to one of the numbers and the total to make a complement of 20. They are **generalising** when they change the ones to tens, 6 to 60 and 4 to 40, to make a complement of 100.

SENTENCE STARTERS

- I found the pattern … so …
- I think this … because …
- I could try …

Conjecture and convincing



Conjecturing

Conjecturing involves forming questions or ideas about mathematical patterns. Learners say what they notice or why something happens or what they think about something.

Example:

February is the only month with 28 days, 29 in a leap year. All the other months have 30 or 31 days. Is there a pattern to how many days there are in each month?

Learners will show they are **conjecturing** when they offer suggestions for a pattern. Checking to see if their suggestion works, they may then suggest a change in their conjecture or make an entirely new conjecture.

SENTENCE STARTERS

- I think that …
- I wonder if …
- I've noticed that …

Convincing

Convincing involves presenting evidence to justify or challenge mathematical ideas or solutions. Learners persuade people (a partner, group, class or an adult) that a conjecture is true.

Example:

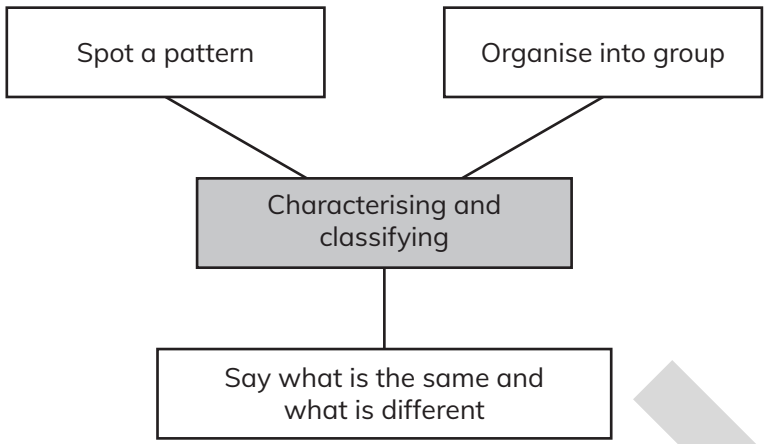
Write the multiplication table for 0. How is this the same as any other multiplication table? How is it different?

Learners will be **convincing** themselves and others as they look for and identify how the multiplication for 0 is the same as other multiplication tables (it has the same format) and how it is different (all the products are 0).

SENTENCE STARTERS

- This is because …
- You can see that …
- I agree with … because …
- I disagree with … because …
- I think that …

Characterising and classifying



Characterising

Characterising involves identifying and describing the properties of mathematical objects. Learners identify and describe the mathematical properties of a number or object.

Example:

How many months in this year have a Monday 4th?

Learners will show they are **characterising** when they use the calendar to find Mondays which are also the 4th of the month. They will be checking for both properties at the same time, a particular day and a particular date.

SENTENCE STARTERS

- This is the same as …
- These are all the same because they all …
- These are different because …

Classifying

Classifying involves organising mathematical objects into groups according to their properties. Learners organise objects or numbers into groups according their mathematical properties or allocate a mathematical object to an existing group. They also use the characteristics of a group to identify further or missing objects.

Example:

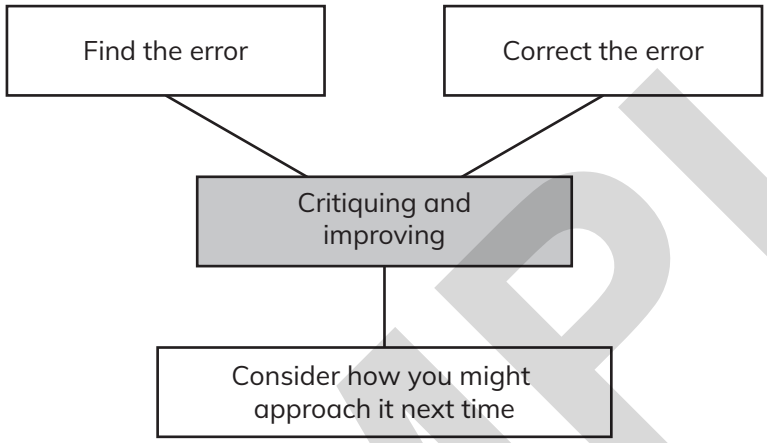
A number rounded to the nearest 10 is 60. What could the number be?

Learners will show they are **classifying** when they recall that numbers can be rounded up to the next ten and down to the current tens number. They need to list both to find all the possible numbers which could be rounded to 60.

SENTENCE STARTERS

- … belongs to this group because …
- … go together because …
- I can sort the … into groups according to …

Critiquing and improving



Critiquing

Critiquing involves comparing and evaluating mathematical ideas or checking solutions. When checking statements such as those below, learners will have to check that both sides of the equals sign give the same total. If they do not, learners will need to decide which side they will consider as correct, so that they can amend the other side. Learners will use a range of strategies to notice and correct any errors.

Example:

Tick the correct equivalent number facts. Correct those that are incorrect.

53 + 24 = 54 + 25 63 + 25 = 53 + 35

85 − 33 = 95 − 23 37 − 12 = 39 − 14

Learners are **critiquing** when they notice and correct an error.

SENTENCE STARTERS

- Have you tried …
- It might be better to …
- I think … because …
- That is not correct because …

Improving

Improving involves refining mathematical ideas to develop a more effective approach or solution. Learners find a better solution or a better approach to use in future.

Example:

Compare your investigation with a friend's. If you were going to do the investigation again, would you do something different?

These questions could be asked after any investigation and provide learners with an opportunity to critique each other's work and **improve** it in the light of the comments made. Learners may improve their work immediately or see a different approach which they could use for themselves next time.

SENTENCE STARTERS

- I like the way you …
- It would be better if …
- That is a better way of doing it because …

Developing mental strategies

Teachers cannot see what is going on inside a learner's head, but they can hear it and see the results. Learners can describe, show and explain their thinking using counting objects, shapes, patterns, measuring tools or something else. To find out what learners are thinking, you may need to listen in when learners talk to or show their work or ideas to a partner or a group, ask learners questions or simply ask learners to explain. See below for some suggested questions. As Stage 2 progresses, learners will be increasingly able to explain their thinking. Encourage the use of spoken and written words, diagrams, symbols and other written work, often alongside practical resources.

Teachers need to introduce and model the relevant vocabulary so that learners have the words they need to talk about their strategies. Class teachers should value learner's intuitive methods as well as introducing methods and approaches for learners to practise. Learners then have the opportunity to choose which strategy to use and develop their own. Any method that works is a correct method. It is important that you provide regular opportunities for learners to explain and discuss their methods, so they share ideas with one another and acquire a range of mental strategies. Not all learners will carry out a mental calculation in the same way, but some methods are more efficient and reliable than others. If you allow time for learners to discuss, explain and compare different methods you can support them to choose and use efficient methods. Learners will see the need for methods that can be applied generally, and this eventually leads towards using standard written methods. This helps to raise learners' awareness of other strategies and develop their confidence and fluency. This could be through mini plenaries within the session or during a closing plenary.

Mental strategies are not restricted to calculations. Visualising patterns, shapes and quantities is a key skill which supports learners to develop their mental imagery and strategies across all areas of mathematics. As learners manipulate objects, they are internalising their actions and making sense of the mathematics.

There are many patterns in our counting sequence. Learners need to recognise and internalise these so that they can use them to develop their understanding of how our number system works and how it all fits together. Learners will then use this information to predict the next number when counting in ones, twos, fives and tens. Counting in multiples of 2, 5 and 10 will support learners as they develop their understanding of multiplication and division. As learners begin to learn about place value in numbers, they will develop a sense of the size of numbers so that they can compare and order them.

Learners need to experience quantities of objects and measures to support estimating. Learners will have already experienced estimating measurements using non-standard measures such as their own foot or hand span. With some experience of standard units of measure such as centimetres, grams and litres, learners will begin to estimate measurements. The same is true of numbers. As learners extend their counting range to 100, they also need to experience collections of 10, 20, 50 and 100 objects before they can estimate amounts. With some experience of a number line, they will begin to estimate the position of a number when only a few key positions are marked.

In Stage 2, learners begin to calculate with numbers up to a total of 100. Learners add and subtract 2-digit numbers, without regrouping ones or tens. This gives learners lots of opportunities to practise and begin to recall number facts for all numbers up to 9, since this is the maximum number

of ones and of tens that learners can total to or subtract from without regrouping. These number facts underpin later development as learners move on to regrouping ones and tens with numbers up to 3 digits in Stage 3.

The restriction on regrouping of ones or tens limits learners when estimating the result of a calculation. When adding or subtracting ones to or from a 2-digit number, learners will be working within the same ten, so there is little to estimate. When adding or subtracting tens to or from a 2-digit number, the process of estimating by looking only at the tens is the same as the process of adding or subtracting tens when there is no regrouping. Learners can make some general statements about number answers being less than or greater than 50, for example, but they are likely to have completed the calculation mentally and really be talking about their solution. It is only when adding or subtracting two 2-digit numbers that learners can truly begin to estimate the result of their calculations, to alert themselves to any errors. Estimating using rounding to the nearest 10 is introduced once learners have some experience of adding two 2-digit numbers or subtracting a 2-digit number from a 2-digit number. At first, learners will count on or back in tens, but they will move on to calculating mentally. This key mental strategy for estimating will be developed further in Stage 3.

Use starters to practise basic skills such as counting, patterns and the features of shapes. Focus on an area that is relevant for the session. For example, if you are about to introduce learners to a new 2D shape such as a pentagon, hexagon or octagon, revise the features of known 2D shapes in the starter. This helps learners to recall and use the appropriate vocabulary before applying this to the new shape. If learners struggle with an aspect of the starter, identify the misconception and clarify that before moving on to the main session.

Key starters

- Count forward and back in twos, fives or tens from any start number. Use different voices, for example: deep like a giant, squeaky like a mouse, quiet as a whisper, loud as a countdown, slow as a creature waking up, fast as a bee flitting from flower to flower. There is no need to count from 0 to 100. Build this up gradually by starting from where learners are secure and extend to less familiar numbers. Focus on the difficult areas, such as crossing to the previous ten when counting back. Sometimes use a pendulum for support. This is particularly useful when counting in ones and twos.
- Practise and consolidate the rapid and accurate recall of addition and subtraction number facts to 9.
- Continue to practise and recall complements to 10 and 20.
- Revise and share mental strategies for tackling a number problem, perhaps discussing what learners did in a previous session.
- Look at an array and describe it with a number sentence. Ask, for example: Can you think of a repeated addition/multiplication/division number sentence for this array? Can you find all the number sentences for this array?
- Revisit a concept to revise what it means and how to use it, for example, fractions. What is a fraction? How do you find one? Can you do it in a different way? What is half? What is a quarter? How can you find a half or a quarter of a shape or number? Can you do it another way?
- Extend a pattern at either end or identify errors. Ask, for example: What comes next in my pattern? Why doesn't this come next? Is there a mistake? If so, where is it and how could you correct it?

- Explore shapes, for example, put a 2D shape in a bag and expose just a small part of it. Ask, for example: What do you see? What shape could it be? What shape can't it be? Why not? Which 3D shapes have a face this shape?

Key plenaries

- Share different mental strategies used in the session.
- Ask learners to explain why they used that method or approach and if they would use the same approach again.
- Discuss other approaches that could have been used.
- Discuss estimates. Ask learners how they decide upon their estimate, sharing ideas.
- Complete a puzzle based on the session. Ask learners how they found their solution.
- Use 'If I know this, what else do I know?' to revise the main session and link to other areas of mathematics.
- Ask open questions such as, 'If the answer is 53 (or pyramid or something else), what could the question be?'
- Make a conjecture and ask whether it is always, sometimes or never true. Ask learners to explain how they know.
- Reinforce the correct use of mathematical vocabulary.

Asking learners to explain their mental strategies can happen at any time during a session. Useful questions include:

- How do you know how many without counting?
- How did you find your answer?
- Can you do it a different way?
- Can you show me what you mean?
- How do you know?
- Why can't the answer be …?

By the end of Stage 2, learners should be able to:

- Count to and back in ones, twos, fives and tens (0 - 100).
- Use place value to help develop a sense of the size of a number.
- Regroup a number in different ways.
- Use patterns of similar calculations.
- Recall number facts to 9 and number bonds for 10 and 20.
- Know the relationship between addition and subtraction.
- Know the multiplication tables for 1, 2, 5 and 10.
- Estimate quantities and measures.
- Extend a pattern, notice and correct mistakes in patterns.
- Recognise, describe and use some features of 2D and 3D shapes.
- Link 2D and 3D shapes to everyday objects.

This is not an exhaustive list, but these are key areas which will be built upon in Stage 3.

Approaches to teaching and learning

The following are the key pedagogies underpinning our course content and how we understand and define them.

Active learning

Active learning is a teaching approach that places student learning at its centre. It focuses on how students learn, not just on what they learn. We, as teachers, need to encourage learners to 'think hard', rather than passively receive information. Active learning encourages learners to take responsibility for their learning and supports them in becoming independent and confident learners in school and beyond.

Assessment for Learning

Assessment for Learning (AfL) is a teaching approach that generates feedback which can be used to improve learners' performance. Learners become more involved in the learning process and, from this, gain confidence in what they are expected to learn and to what standard. We, as teachers, gain insights into a learner's level of understanding of a particular concept or topic, which helps to inform how we support their progression.

Differentiation

Differentiation is usually presented as a teaching approach where teachers think of learners as individuals and learning as a personalised process. Whilst precise definitions can vary, typically the core aim of differentiation is viewed as ensuring that all learners, no matter their ability, interest or context, make progress towards their learning intentions. Teachers therefore need to be responsive, and willing and able to adapt their teaching to meet the needs of their learners.

Language awareness

For many learners, English is an additional language. It might be their second or perhaps their third language. Depending on the school context, learners might be learning all or just some of their subjects through English.

For all learners, regardless of whether they are learning through their first language or an additional language, language is a vehicle for learning. It is through language that students access the learning intentions of the lesson and communicate their ideas. It is our responsibility, as teachers, to ensure that language doesn't present a barrier to learning.

Metacognition

Metacognition describes the processes involved when learners plan, monitor, evaluate and make changes to their own learning behaviours. These processes help learners to think about their own learning more explicitly and ensure that they are able to meet a learning goal that they have identified themselves or that we, as teachers, have set.

Skills for Life

How do we prepare learners to succeed in a fast-changing world? To collaborate with people from around the globe? To create innovation as technology increasingly takes over routine work? To use advanced thinking skills in the face of more complex challenges? To show resilience in the face of constant change? At Cambridge, we are responding to educators who have asked for a way to understand how all these different approaches to life skills and competencies relate to their teaching. We have grouped these skills into six main Areas of Competency that can be incorporated into teaching, and have examined the different stages of the learning journey and how these competencies vary across each stage.

These six key areas are:

- Creativity – finding new ways of doing things, and solutions to problems
- Collaboration – the ability to work well with others
- Communication – speaking and presenting confidently and participating effectively in meetings
- Critical thinking – evaluating what is heard or read, and linking ideas constructively
- Learning to learn – developing the skills to learn more effectively
- Social responsibilities – contributing to social groups, and being able to talk to and work with people from other cultures.

Cambridge learner and teacher attributes

This course helps develop the following Cambridge learner and teacher attributes.

Cambridge learners	Cambridge teachers
Confident in working with information and ideas – their own and those of others.	**Confident** in teaching their subject and engaging each student in learning.
Responsible for themselves, responsive to and respectful of others.	**Responsible** for themselves, responsive to and respectful of others.
Reflective as learners, developing their ability to learn.	**Reflective** as learners themselves, developing their practice.
Innovative and equipped for new and future challenges.	**Innovative** and equipped for new and future challenges.
Engaged intellectually and socially, ready to make a difference.	**Engaged** intellectually, professionally and socially, ready to make a difference.

Reproduced from Developing the Cambridge learner attributes *with permission from Cambridge Assessment International Education.*

More information about these approaches to teaching and learning is available to download from Cambridge GO (as part of this Teacher's Resource).

Setting up for success

Our aim is to support better learning in the classroom with resources that allow for increased learner autonomy while supporting teachers to facilitate student learning.

Through an active learning approach of enquiry-led tasks, open-ended questions and opportunities to externalise thinking in a variety of ways, learners will develop analysis, evaluation and problem-solving skills.

Some ideas to consider to encourage an active learning environment are as follows:

- Set up seating to make group work easy.
- Create classroom routines to help learners to transition between different types of activity efficiently, e.g. move from pair work to listening to the teacher to independent work.
- Source mini-whiteboards, which allow you to get feedback from all learners rapidly.
- Start a portfolio for each learner, keeping key pieces of work to show progress at parent–teacher days.
- Have a display area with learner work and vocab flashcards.

Planning for active learning

1 **Planning learning intentions and success criteria:** these are the most important features of the lesson. Teachers and learners need to know where they are going in order to plan a route to get there.

2 **Introducing the lesson:** include a 'hook' or starter to engage learners using imaginative strategies. This should be an activity where all learners are active from the start of the lesson.

3 **Managing activities:** during the lesson, try to: give clear instructions, with modelling and written support; coordinate logical and orderly transitions between activities; make sure that learning is active and all learners are engaged; create opportunities for discussion around key concepts.

4 **Assessment for Learning and differentiation:** use a wide range of Assessment for Learning techniques and adapt activities to a wide range of abilities. Address misconceptions at appropriate points and give meaningful oral and written feedback which learners can act on.

5 **Plenary and reflection:** at the end of each activity and at the end of each lesson, try to: ask learners to reflect on what they have learnt compared to the beginning of the lesson; build on and extend this learning.

To help planning using this approach, a blank Lesson plan template is available to download from Cambridge GO (as part of this Teacher's Resource). There are also examples of completed lesson plans.

We offer a range of Professional Development support to help you teach Cambridge Primary Mathematics with confidence and skill. For details, visit **cambridge.org/education**

Acknowledgements

1 Numbers to 100

Unit plan

Topic	Approximate number of learning hours	Outline of learning content	Resources
1.1 Numbers to 100	5	Recite, read and write numbers to 100, recognising the value of each digit.	Learner's Book Section 1.1 Workbook Section 1.1 Additional teaching ideas for Section 1.1 Resource sheet 1A Resource sheet 1B Resource sheet 1C Resource sheet 1D Resource sheet 1E Resource sheet 1F Resource sheet 1G Resource sheet 1H
1.2 Counting up to 100 objects	5	Estimate and count up to 100 objects.	Learner's Book Section 1.2 Workbook Section 1.2 Additional teaching ideas for Section 1.2 Resource sheet 1C Resource sheet 1D Resource sheet 1F Resource sheet 1I Resource sheet 1J

CONTINUED			
Topic	Approximate number of learning hours	Outline of learning content	Resources
1.3 Comparing and ordering numbers	5	Compare and order numbers to 100.	Learner's Book Section 1.3 Workbook Section 1.3 Additional teaching ideas for Section 1.3 Resource sheet 1B Resource sheet 1C Resource sheet 1D Resource sheet 1K Resource sheet 1L Resource sheet 1M
Cross-unit resources			
Diagnostic check and mark scheme Learner's Book Check your progress **Digital Classroom:** Unit 1 video: Numbers all around you: 20–100 **Digital Classroom:** Digital manipulative: Interactive 100 square **Digital Classroom:** Unit 1 activity Worksheet 1A Worksheet 1B Worksheet 1C Language worksheet 1A Language worksheet 1B			

Thinking and Working Mathematically questions in Unit 1

Questions	TWM characteristics covered
Learner's Book	
Exercise 1.1 question 3	Characterising, classifying
Exercise 1.1 Let's investigate	Conjecturing, convincing, characterising, classifying
Exercise 1.1 question 5	Specialising, generalising
Exercise 1.1 question 6	Specialising, generalising, characterising, classifying
Exercise 1.2 Let's investigate 1	Characterising, classifying
Exercise 1.2 Let's investigate 2	Generalising, convincing, characterising, classifying
Exercise 1.3 question 1	Convincing, characterising, classifying
Exercise 1.3 question 5	Characterising, classifying
Exercise 1.3 question 6	Characterising, classifying
Exercise 1.3 Let's investigate	Convincing, critiquing, improving

Workbook	
Exercise 1.1 question 5	Specialising, generalising
Exercise 1.1 question 7	Characterising, classifying
Exercise 1.1 question 8	Specialising, generalising
Exercise 1.1 question 10	Characterising, classifying
Exercise 1.2 question 5	Generalising, characterising
Exercise 1.2 question 10	Specialising, generalising, critiquing
Exercise 1.2 question 12	Specialising, generalising, characterising, classifying
Exercise 1.3 question 1	Convincing, characterising, classifying
Exercise 1.3 question 7	Characterising, classifying
Exercise 1.3 question 8	Characterising, classifying
Exercise 1.3 question 11	Characterising, classifying
Exercise 1.3 question 16	Characterising, classifying

BACKGROUND KNOWLEDGE

Before starting this unit, you may want to use the diagnostic check to make sure that learners are ready to begin Stage 2. The diagnostic check can help you to identify gaps in learners' knowledge or understanding, which you can help them address before beginning this unit.

This unit extends learners' understanding of numbers from 20 to 100. By the end of the unit, learners will recognise the value of each digit in a 2-digit number. They will be able to compare and order numbers within 100 and estimate quantities. To start the unit, learners need a good understanding of numbers to 20.

All numbers use the digits 0 to 9. These digits have different values depending on their position. Learners need to be exposed to all three aspects of place value.

- Positional: the position of a digit determines its value, for example in the number 27, the 2 is in the tens place so it represents 2 tens. The 7 is in the ones place, so it represents 7 ones.
- Multiplicative: each digit is multiplied by the value of its position, so the 2 in 27 is multiplied by 10 to give 20. The 7 in 27 is in the ones place, so it is multiplied by 1 to give 7.
- Additive: the individual values of each digit are added together to give the whole number, for example in the number 27, 20 + 7 = 27

As learners begin to recognise the value of each digit, they can compare numbers recognising, for example, that 40 is greater than 27. The position of the 4 in 40 means that it has a value of 4 tens. In 27, the position of the 2 indicates that it has a value of 2 tens. Four tens is more than 2 tens, so 40 is greater than 27.

Digital Classroom: Use the Unit 1 video to introduce the content of this unit. The i button will explain how to use the video.

Supporting learners with the Getting started exercise

The Getting started questions focus on numbers to 20. Look at the question the learner or learners had difficulty with and revisit that area. A worked example and some further questions could be all that is needed as a reminder. If learners have deeper misunderstandings, then you need to deal with these before moving on to larger numbers.

TEACHING SKILLS FOCUS

Manipulatives

Using manipulatives allows 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. Seeing what is meant by mathematical words such as 'more than', 'fewer than', 'the same', 'odd' and 'even' helps learners to develop deep understanding.

Learners should use a wide range of materials to explore numbers and their characteristics. Manipulatives could include everything used in Stage 1 and other manipulatives which clearly show base 10, for example Dienes blocks. Use different objects to represent 1 and 10 or 10 of the 1 representation to represent 10 to prevent misconceptions from developing. These could link with the current topic. Set aside one session for learners to play with any new manipulatives before expecting them to use these to support their learning. Work alongside the learners, making suggestions but not doing it for the learner.

Pictures within the Learner's Book and Workbook echo what the learners have experienced. Encourage learners to get out similar materials to manipulate to support their developing understanding.

At the end of this unit, consider which manipulatives were regularly used by the learners.

- Should you consider changing some of these?
- Have you organised the classroom so that learners have access to these resources whenever they are doing any mathematics and perhaps at other times too?
- Could your classroom now be considered an active learning environment?
- If colleagues came into your classroom, could they tell that learners were engaged in mathematics?

1.1 Numbers to 100

LEARNING PLAN

Framework codes	Learning objectives	Success criteria
2Ni.01	• Recite, read and write number names and whole numbers (from 0 to 100).	• Learners can recite, read and write numbers from 0 to 100.
2Np.01	• Understand and explain that the value of each digit in a 2-digit number is determined by its position in that number, recognising zero as a place holder.	• Learners recognise the value of each digit in a 2-digit number, including 0 as a place holder.
2Np.02	• Compose, decompose and regroup 2-digit numbers using tens and ones.	• Learners can compose, decompose and regroup 2-digit numbers using tens and ones.
2Nc.04	• Count on and count back in ones, twos, fives or tens, starting from any number (from 0 to 100).	• Learners can count on and back in ones and tens from any number from 0 to 100.

LANGUAGE SUPPORT

Model the correct use of mathematical language yourself. Refer to a digit within a 2-digit number as a digit. Calling it a number can confuse learners. Use row and column to describe the layout of the 100 square. When learners make a model of a number, whatever they use, they are making a representation of the number.

Column: arrangement of numbers or objects in a line, running up and down the page or surface

Digit: the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. The value of the digit is determined by its position in a 2-digit number. For example, in 38, the 3 has a value of 3 tens, the 8 has a value of 8 ones.

Place holder: 0 is used as a place holder in numbers such as 40. The 4 has a value of 4 tens. Without the 0, it would become 4, which has a value of 4 ones.

Representation: a picture or model of something

Row: arrangement of numbers or objects in a line, running across the page or surface

Tens numbers: numbers with tens but no ones, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Common misconceptions

Misconception	How to identify	How to overcome
Learners may confuse the order of the tens numbers.	Ask learners to count on in ones from 45 (or a similar number) into the next ten.	Count in tens from 10 to 100 to recall the order. Use a 100 square or number line for support when counting in ones or tens.
Learners may confuse the value of each digit.	Ask learners which is the greater number, 42 or 27.	Use place value cards to reinforce the value of each digit.
Learners may not recognise 0 as a place holder, leaving it out of the number.	Ask learners to tell you what they know about a number with no ones in the ones place, such as 30.	Model 30 with base 10 equipment or sticks of 10 cubes. Compare representations of 30 and 3 to see the importance of 0 as a place holder.

Starter idea

What do you know about number 17? (10 minutes + 10 minutes Getting started exercise)

Resources: Mini whiteboards and pens; place value cards to 20 (Resource sheet 1A); ten frames (Resource sheet 1E) and counting objects; 0–20 number line (Resource sheet 1B).

Description: Ask learners to work in pairs to record a list of what they know about 17. Challenge the class to collect at least 17 different ideas about 17. Learners could use any of the resources for support.

After 5 minutes, share ideas. Record these around the number 17, for example 17 = 10 + 7, odd number, 3 fewer than 20, 1 more than 16 and so on. Accept other idea, for example, 'I live at number 17,' or 'I travel to school on the number 17 bus'.

Repeat the starter another day focusing on a different number.

After this activity, learners should complete the Getting started exercise in the Learner's Book. This will allow you to see if there is anything further that needs revising before you start the rest of the unit.

Main teaching idea

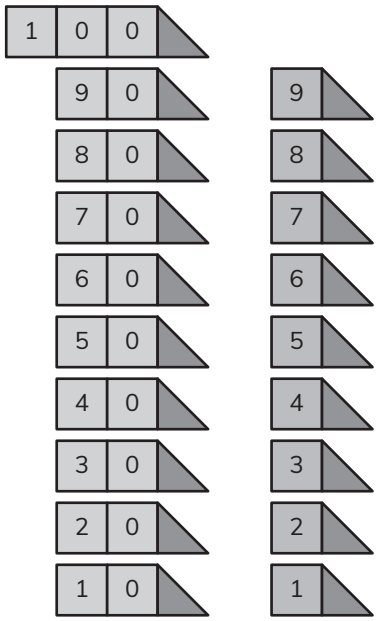
To 100 (40 minutes)

Learning intention: Learners recite and read numbers from 0 to 100. Learners begin to recognise the value of each **digit** in a 2-digit number, including 0 as a **place holder**. They compose and decompose 2-digit numbers using tens and ones.

Resources: A large set of place value cards (Resource sheet 1D enlarged); a set of place value cards for each pair of learners (Resource sheet 1D); large 100 square (Resource sheet 1C enlarged).

Description: **Digital Classroom**: Use the multimedia enhancement to lead a class discussion on where numbers to 100 appear around us and what they are used for. The i button will explain how to use the

multimedia enhancement. Give each pair of learners a set of place value cards. Explain how to set out the cards to make it easier to take a card from each **column** to make a 2-digit number.



- Ask learners to count along the tens cards as one 10, two tens, three tens and so on to ten tens, 100. Repeat the count as 10, 20, 30 … 100, to practise the number names thirty, forty, … one hundred.
- Ask one learner in each pair to pick up the ten card. They then make 11 by picking up the 1 card and placing it with the 10. The learner replaces the 1 and picks up the 2 to make 12, all the way up to 19 as the class counts aloud at a matching pace.
- Explain that when we count on from 20, we say the whole numbers by saying the parts shown on the cards: twenty-one, twenty-two and so on. At each new tens number, we repeat the pattern. Ask the second learner to pick up the 20 and make 21, then 22, all the way up to 29 as the class counts. Learners swap roles at each new tens number. Count to 100 together in this way.
- Display a 100 square and give learners 5 to 10 minutes to talk to their partner about what they notice. Share ideas.
- Ask learners to use their place value cards to make a number such as 34. Then discuss which card they would change to make the other numbers in that **row** on the 100 square. Focus on keeping the same tens number but changing the ones number. Make a different number and ask learners which card they would change to make the other numbers in that column. Focus on keeping the same ones number but changing the tens number.
- Revisit this session. You may need to focus on batches of 20 to 30 numbers to clarify the value of the digits.

After this activity, learners could try Learner's Book Exercise 1.1 questions 1, 2 and 3, Workbook Exercise 1.1 questions 1, 2, 3, 6 and 7.

› **Differentiation ideas:** To support learners who find this difficult, slow the count or repeat with a small group.

To challenge confident learners, ask them to look for patterns. Challenge them to explain the pattern they have noticed.

Plenary idea

Missing numbers (10 minutes)

Resources: Large 100 square; card squares to cover a selection of numbers.

Description: Cover single numbers, L shapes, diagonals and other interesting shapes within the 100 square. Include crosses after working through main activity '1 fewer, 1 more; 10 fewer, 10 more'. Learners work in pairs, choosing a shape to complete. Share ideas and check. Revisit this activity in future plenaries to consolidate understanding, moving on to separate jigsaw pieces of the 100 square in a range of shapes instead of covering numbers on the 100 square.

Use the differentiated worksheets to give learners further practise.

› **Assessment ideas:** Listen to learner's reasons for their answers. Do they talk about the tens and ones digits? Ask questions such as, 'What makes you think that?' or 'Is that always true?' to prompt learners to explain further. Carefully target your questions and requests for explanations to ensure you have detailed formative assessment to use to support planning the next steps.

More teaching ideas are available to download from Cambridge GO (as part of this Teacher's Resource).

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Section 1.1, Let's investigate after question 3

The questions prompt learners to look for similarities and differences in the rows of a 100 square. Ask learners to make an initial **conjecture** (TWM.03) and then check whether or not their conjecture is true by looking at

further rows to **convince** (TWM.04) themselves. An initial conjecture may lead to learners improving that conjecture. Learners should conclude that all rows have 1 to 9 and 0 in the ones place. Others may notice that each row has a different number of tens in it. Learners will have **characterised** (TWM.05) and then **classified** (TWM.06) to reach their conclusion. Paying attention to how learners describe what is the same and what is different will give you useful formative assessment information and will help you to recognise the depth of the learner's understanding. Challenge some learners by asking if the same is true on the slides and ladders board. This will lead to further conjecturing and convincing.

CROSS-CURRICULAR LINKS

Numbers are used in many areas of the curriculum. Ask learners to look out for those used in measuring, particularly in science, design and technology. In literacy, ask learners to notice where the numbers appear in order, for example page numbers in books. Numbers may also occur in titles, for example, *1 is a snail, 10 is a crab* by April Pulley Sayre (2006, Candlewick) or *100 things* by Masayuki Sebe (2011, Gecko Press).

Homework ideas

Ask learners to look out for examples of numbers to 100 at home, as well as on the way to or from school. These might include door or road numbers, some car number plates and on packaging. At home, learners could check how many pages are in a newspaper, magazine or comic. Give learners the opportunity to talk about what they noticed.

Invite learners to bring in a story book which has a number in its title. Display the books alongside examples from the class and school library. Give learners time to read the books.

1.2 Counting up to 100 objects

LEARNING PLAN

Framework codes	Learning objectives	Success criteria
2Nc.01	• Count objects from 0 to 100.	• Learners can count a larger quantity of objects by grouping them in tens.
2Nc.03	• Estimate the number of objects or people (up to 100).	• Learners can estimate how many objects by choosing between 10, 20, 50 or 100 as an estimate.
2Nc.04	• Count on and count back in ones, twos, fives or tens, starting from any number (from 0 to 100).	• Learners can count on and back in ones, twos or tens, starting at any number (counting in fives will be explored in Unit 2).

CONTINUED

Framework codes	Learning objectives	Success criteria
2Nc.05	• Recognise the characteristics of even and odd numbers (from 0 to 100).	• Learners recognise that even numbers have 2, 4, 6, 8 or 0 in the ones place and odd numbers have 1, 3, 5, 7 or 9 in the ones place.
2Np.01	• Understand and explain that the value of each digit in a 2-digit number is determined by its position in that number, recognising zero as a place holder.	• Learners recognise and can record a 2-digit number represented by different resources in tens and ones.
2Np.02	• Compose, decompose and regroup 2-digit numbers using tens and ones.	• Learners can compose and decompose 2-digit numbers using tens and ones in different representations.

LANGUAGE SUPPORT

Continue to model the correct use of all vocabulary. When learners count a collection correctly, tell them that they worked 'accurately' as this will help them to understand the meaning of the word.

Accurate: correct, without any mistakes or errors

Collection: a group of similar items

Order or ordering numbers: place numbers or objects there may not be a pattern. according to size, from smallest to greatest or greatest to smallest

Scoop: put both hands together to make a bowl and use the bowl to pick up objects

Common misconceptions

Misconception	How to identify	How to overcome
Learners continue counts across ten boundaries for example twenty-nine, twenty-ten.	Ask learners to count on from 25.	Count in tens, using ten frames for support. Remind learners that the digit 2 represents 2 tens and when they have another full ten, the digit changes to 3, 3 tens. Look at the pattern of the numbers in the 100 square.
Learners write numbers such as 21 as 201.	Ask learners to write a number such as 21.	Use place value cards to show that the position of the digit gives its value. Two tens is written as 20, with 0 as the place holder because there are no ones. Twenty-one needs the two cards 20 and 1. The 1 is layered on top of the 0 to make 21, two tens and one 1.

Starter idea

Counting in tens (10 minutes)

Resources: Tens numbers cards (Resource sheet 1I); washing line and pegs.

Description: Give out the tens cards to 11 learners. Ask the learner with 0 to come and peg their number at the beginning of the washing line. Explain that the cards are the tens numbers and invite learners to peg the cards on the line in the correct order. Count along the line together, forwards and backwards. Remind learners that they need to know the order of the tens numbers to be able to count to 100. Check that learners understand that the numbers are 1 ten, 2 tens, 3 tens and so on up to 10 tens. Show learners how to use the order of the ones to help them recall the order of the tens, for example after 3 tens comes 4 tens, forty.

In further starters, ask learners to notice a missing or swapped tens number or other mistake in the ordering of the numbers.

After this activity, learners could try Learner's Book Exercise 1.2 question 1, Workbook Exercise 1.2 questions 1, 2, 3 and 7.

Main teaching idea

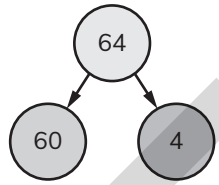
Counting handfuls (40 minutes)

Learning intentions: Learners count up to 100 objects. Learners put the objects into tens, count in tens and then in ones to find the total.

Resources: A large 100 square; various sets of up to 100 objects in trays or bowls (small shells, pebbles, beans or other counting objects); mini whiteboards and pens; small containers, for example paper cups or yogurt pots.

Description: Explain that now learners know the order of numbers to 100, they can count up to 100 objects. **Scoop** up about half a set of objects using two hands. Place them on the table and ask learners to estimate whether you have collected more or fewer than 50. Explain that counting in ones to check takes a long time and it is easy to make a mistake. Put the objects into piles of ten until there are fewer than 10 left. Count the piles in tens and count on in ones to find the total. Using place value cards, match the tens and ones cards with the objects. Record in a part whole diagram to clearly show the tens and the ones.

Learners work in pairs, taking it in turns to scoop out objects using both hands. After estimating, they put the objects into tens then count them. Learners can use a cup for each ten or make small piles. Learners draw a part whole diagram on their mini whiteboards to record their count. These are easier to draw than place value cards.



Discuss the counting. Were there any difficulties when switching from counting on in tens to counting on in ones? Remind learners that they could count a collection in twos, or count on in twos after counting in tens.

Revisit this or a similar activity to practise counting large **collections**. Sometimes give learners a number card and ask them to count out that many counters, cubes or other small objects. Ask them to display their counted objects in tens and ones to make them easy to check. Use opportunities such as checking new resources or stocktaking to give a context to counting. Counting for a purpose motivates learners and will give you more opportunities for formative assessment.

› **Differentiation ideas:** Give learners who find this difficult ten frames to place ten objects on and a 100 square to support counting in tens. Smaller objects can be placed directly on to the 100 square, 1 object in each space. This is awkward and time consuming, but it may be helpful for some learners at first.

To challenge confident learners, give them a target number to aim for when scooping out the objects. How **close** to their target was their collection?

Plenary idea

Tens numbers (10 minutes)

Resources: Counting in tens cards (Resource sheet 1J) for each pair of learners; scissors.

Description: Show learners the pictures of tens in Counting in tens cards (Resource sheet 1J). Spider crabs with 10 legs, ten frame and sticks of 10 cubes are used to show each of the tens numbers. Ask pairs of learners to cut out the cards and mix them all together. Learners then have half the cards (15) each. Learners play snap to develop quick recognition of the quantities. They take it in turns to turn over the top card in their pile. If the cards match, the first learner to call out 'snap' claims the cards. The winner is the first player to collect all of the cards.

Ask learners which **representation** of tens they prefer. Can they explain why? Do learners sort that particular set of cards faster than any other set?

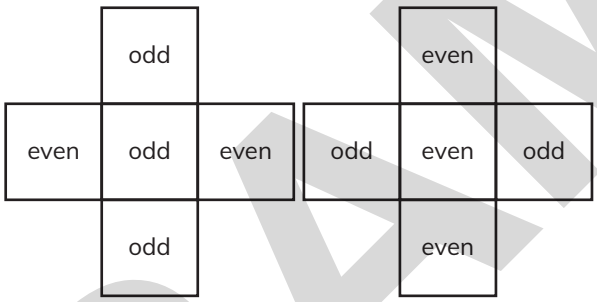
Assessment ideas: Do learners quickly recognise the value of the card they have turned over? Learners need to count in tens or count in ones and recognise the value of that many tens to recognise the value of each card. Observe learners sorting a set of cards into order. Are they clear about the order? These activities give you plenty of opportunity for formative assessment to inform your next lesson.

More teaching ideas are available to download from Cambridge GO (as part of this Teacher's Resource).

Guidance on selected Thinking and Working Mathematically

Learner's Book Section 1.2, Let's investigate after question 4

This investigation gives a **conjecture** (TWM.03) about the numbers within a cross shape on a 100 square. Encourage learners to make and check some crosses to see if the conjecture is true. Some learners may be convinced by a few examples, others will be able to generalise to prove the conjecture is true using what they know about odd and even numbers, for example:



Learners will be **characterising** (TWM.05) and **classifying** (TWM.06) numbers as odd and even and recognising that all the crosses within the 100 square will give either of the layouts shown above. If learners recall that every other number is odd, and every other number is even when counting in ones, any row of 3 numbers can only give 2 even and 1 odd number or 1 even and 2 odd numbers. In a column, either all the numbers are odd or they are all even, depending on the number of ones and not the number of tens. Close examination of the pattern of odds and evens will allow learners to justify their answer and **convince** (TWM.04) others. Listen in to these explanations.

CROSS-CURRICULAR LINKS

Numbers are used in many areas of the curriculum. Ask learners to look out for those used to show the contents of packs of resources in science, design and technology. In literacy, ask learners to check how many pages there are in reading books and information books.

Homework ideas

Send home a slip of paper to ask parents and carers to allow the learner to estimate and then count how many there are. This could be a kitchen item such as tea bags or a bathroom item such as cotton wool pads.

Dear Parents and Carers,

We have been estimating and counting up to 100 objects. Do you have a box, bag or packet of something which started off with 100 of something inside? Kitchens and bathrooms are good places to check for items such as tea bags or cotton wool pads. Please show your child the container and encourage them to estimate how many of the 100 are left, then count to check. Please record what you did on the reverse of this slip, and return the slip to your child to bring to school. We will discuss the results in class.

Thank you.

Set question 12 in the Workbook as homework. Learners may need several attempts to find a solution.

1.3 Comparing and ordering numbers

LEARNING PLAN

Framework codes	Learning objectives	Success criteria
2Nc.06	• Recognise, describe and extend numerical sequences (from 0 to 100).	• Learners can say a sequence from a description or describe a given sequence.
2Np.03	• Understand the relative size of quantities to compare and order 2-digit numbers.	• Learners use the value of a number in tens and ones to compare and order numbers.
2Np.04	• Recognise and use ordinal numbers.	• Learners can use ordinal numbers in familiar situations.

LANGUAGE SUPPORT

Be careful to use order and ordinal correctly when talking about numbers. We often put numbers in **order**, from smallest to greatest or from greatest to smallest. Use **ordinal numbers** when talking about the position of a number or object in an ordered list.

Close: near to, nearby

End, stop, finish: different ways of saying last when ordering something

Extend: make longer. For example, write or say the next three numbers in a sequence, 2, 4, 6, 8, 10.

Ordinal numbers: number used to show the position of something, for example first, 1st, second, 2nd, 3rd and so on

Sequence: a set of numbers linked in some way

Start, beginning: different ways of saying first when ordering something

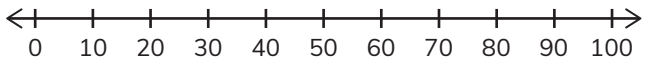
Common misconceptions

Misconception	How to identify	How to overcome
Learners ignore place value when comparing numbers, for example 7 is more than 21.	Ask learners to tell you which number is greater, 9 or 23.	Represent each number using objects on ten frames or linked cubes. Clearly demonstrate that 7 has no tens and 7 ones, while 23 has 2 tens and 3 ones. 2 tens is more than 0 tens.
Learners may compare the ones digits without comparing the tens digits, for example 38 is more than 52 because 8 is more than 2.	Ask learners to tell you which number is fewer, 52 or 38.	Represent each number using objects on ten frames or linked cubes. Clearly demonstrate that 38 has 3 tens and 8 ones, while 52 has 5 tens and 2 ones. 3 tens are fewer than 5 tens, so there is no need to compare the ones.
When comparing numbers with different numbers of tens, learners think they also need to compare the ones.	Ask learners to tell you which number is more, 52 or 38.	Represent only the tens part of each number. 52 has 5 tens, 38 has 3 tens. We already know 52 is more than 38 so we do not need to compare the ones.

Starter idea

Number lines (10 minutes)

Resources: 0–20 number line (Resource sheet 1B); 100 square (Resource sheet 1C); 0–100 number line marked in tens (Resource sheet 1K).



Description:

- Show learners a 0–20 number line and 0–100 number line. Ask them how they are the same and how they are different.
- Check that learners can link the number line to the 100 square. If learners struggle with this, cut a 100 square into ten rows. Join the rows together to make a 1–100 track and compare this with the number line. Some learners might benefit from doing this themselves.
- Count along the number line, forwards and backwards, in tens. Choose a space between two tens numbers and ask learners to tell you which numbers belong in that space. Discuss where each number belongs, for example 45 belongs halfway between 40 and 50.
- Ask learners if it is still true that numbers on the left, nearer to 0, are smaller than those on the right, nearer to 100. Choose some numbers such as 12 and 80 to compare.
- Revisit this starter several times, focusing on positioning numbers on the number line when only the tens numbers are marked.
- Compare two numbers once the position on the number line has been agreed. Ask learners which number is greater or fewer and how they know.

After this activity, learners could try Learner's Book Exercise 1.3 question 1, Workbook Exercise 1.3 questions 1 and 9.

Main teaching idea

Number sequences (40 minutes)

Learning intentions: Recognise, describe and **extend** numerical **sequences** (from 0 to 100).

Resources: Large 100 square; 100 squares (Resource sheet 1C); mini whiteboards and pens.

Description:

- Tell the learners that you are thinking of a sequence of numbers. Your sequence **starts** at 22, counts on in twos and **ends** at 28. Ask learners to tell you all of the numbers in your sequence.

Answer: 22, 24, 26 and 28

- Ask learners what was the same about all of your numbers.

Answer: They all had 2 in the tens place.

- Repeat with another sequence, for example start at 34, count on in tens, and stop at 74. Ask learners to tell you all of the numbers in your sequence.

Answer: 34, 44, 54, 64, 74.

Ask learners what was the same about all of your numbers this time.

Answer: They all had 4 in the ones place.

- Tell learners that there are three important pieces of information to make a sequence: where to start, where to stop and how to get from the start to the end. It could count in ones, twos, tens or something else, either forwards or backwards. The numbers in the sequence make a pattern though it can be difficult to put the pattern into words. Learners will get better at this as they experience more patterns.
- Learners work in pairs, each recording the information for three sequences. Then they swap whiteboards and write the numbers in each other's sequences. Learners then check that their partner has correctly recorded the described sequences. Ask learners to share interesting or unusual sequences.
- Give learners a sequence of numbers. Ask them to describe the numbers within the sequence, sharing ideas. Explain that a sequence can be extended, either at the beginning or the end. Ask learners to say the previous or next two numbers.

After this activity, learners could try Learner's Book Exercise 1.3 questions 3, 4 and 5, Workbook Exercise 1.3 questions 4, 5, 6, 11 and 16.

Learners should be able to recognise, describe and extend simple number sequences.

› **Differentiation ideas:** Give learners who find this difficult a 100 square for support. Encourage them to choose sequences counting in ones or tens so that the numbers sit along a row or column.

To challenge confident learners, give them sequences such as 22, 33, 44, 55, 66 to describe. Ask them to create their own challenging sequences.

Plenary idea

Revisiting number sequences (10 minutes)

Resources: Large 100 square and 0–100 number line marked in tens; mini whiteboards and pens.

Description:

- Describe a number sequence to the learners, for example start at 32, count on in twos, stop at 38. Ask learners to record the sequence on their mini whiteboard.
- Ask learners to tell you their third number, 36.
- Give learners a sequence of numbers, for example 79, 77, 75, 73, 71 and ask them to write the instructions for the sequence on their mini whiteboards.
- Compare some descriptions. There are different ways to say the same thing. For example, start or beginning; stop, end or finish. Any of these words help to clearly describe the sequence.
- Discuss how to describe the numbers in the sequence, for example odd, even, all the numbers have the same number of tens or ones. Descriptions can focus on different things, provided they still describe the sequence.
- Challenge learners by saying, 'The 3rd number in my sequence is 56,' or 'The 5th number in my sequence is 23.' Ask learners to create a sequence to match. Share learners' ideas. Sequences could be very different, but all are correct if they match the given statements.
- Ask learners, 'How do you work out a sequence when you only know one of the numbers and its position in the sequence?'

› **Assessment ideas:** Invite learners to comment on sequences made in response to a statement as above. Learners could say that a sequence counting in ones is easy or straightforward. A sequence counting back in twos from an odd number could be interesting or challenging. Learners are assessing each other and themselves as they recognise and describe the sequences.

More teaching ideas are available to download from Cambridge GO (as part of this Teacher's Resource).

Guidance on selected Thinking and Working Mathematically

Learner's Book Section 1.3, Let's investigate after question 7

Zara asks learners whether it is always, sometimes or never true that they only need to look at the tens number to order numbers. Zara is really offering learners three slightly different **conjectures** (TWM.03). Learners will need to investigate comparing and **ordering numbers** to decide which, if any, of the conjectures they agree with. By trying to **convince** (TWM.04) themselves that one of the conjectures is true, learners may discover that the conjecture is incorrect. This is **critiquing** (TWM.07) and **improving** (TWM.08). When learners have reached a conclusion, ask them to explain how they know they are correct. This will give you the opportunity to assess what the learners think is enough to convince themselves and you. Use this formative assessment to support planning the next steps.

CROSS-CURRICULAR LINKS

Learners will think about order in many areas of the curriculum. When writing instructions in English they may use **ordinal numbers** or words. During physical education, learners may compete against each other and record their position using ordinal numbers.

Homework ideas

Send home a slip of paper to ask parents and carers to allow the learner to order kitchen or bathroom items according to their contents.

Dear Parents and Carers,

We have been comparing and ordering numbers up to 100. Do you have boxes, bags or packets of items with up to 100 of something inside? Kitchens and bathrooms are good places to look. Please show your child the container and encourage them to record the number from the packaging, then order the numbers they have collected. Your child could record their ordered numbers on the reverse of this slip. Please return the slip to your child so that they can bring it to school. We will discuss the results in class.

Thank you.

Learners could also complete a specific question in the Workbook.

Invite learners to write their top 10 of something, labelling their list 1st, 2nd, 3rd … 10th. This could be football players, ice-cream flavours or something else. Make a class scrapbook of the lists.

Assessment ideas

To check learners' understanding of the concepts in this unit, you can:

- use the **Check your progress** exercise at the end of the unit in the Learner's Book, either individually or with the whole class
- use the activity in the **Digital Classroom** with the whole class. The i button will give you more information.
- ask learners to self-assess using the **Look what I can do!** feature in the Learner's Book. As a class, read each statement and ask learners to tick the circle corresponding to how they feel about it. Check learners' self-ratings and plan any follow-up actions.

PROJECT GUIDANCE: PROJECT 1 POSSIBLY ODD

Why do this problem?

This task deepens learners' understanding of odd (and even) numbers, and offers practice in comparing numbers. By challenging them to articulate a way that will always find a solution, learners will have the opportunity to refine their approaches and eventually to **generalise** (TWM.02) their strategy. This project relates to the learning objective 2Nc.05 (Recognise the characteristics of even and odd numbers (from 0 to 100)).

Possible approach

Introduce the task using two sets of 0–9 digit cards. Lay out one set face up and place the other set in a pile, face down. Invite a pair of learners to come up and ask them to take the top card from the face-down pile, and show it to everyone. Then pose the question, 'Which card from the face-up set would you put with that card to make the smallest possible two-digit odd number?'

Give all learners time to talk in pairs about the card they would choose and then ask the pair at the front to take a card and to make their number. Does the rest of the class agree that this is an odd number? How do they know? Is this definitely the smallest odd number that we can make using the turned over card and any from the face-up set?

Have another go at the challenge all together so that all learners understand what to do, then set them off in pairs to play together using their own sets of cards. As they work, listen out for clearly articulated reasoning as they justify their choices to each other, and also for pairs who are discussing how to use the zero.

Bring them together for a mini plenary after 5–10 minutes. At this point, ask a few pairs to share their ways of working. Draw attention to the zero/s. What would they do if the card they turn over is a zero? Is it OK to place a zero in the tens position of a two-digit number?

Allow learners more time in their pairs, encouraging them to explain how to choose the second digit each time. As a plenary, work together as a class to create a set of 'instructions' which, if followed, will always give the smallest odd number. Ask learners how the instructions would need to change if the challenge was to make the largest odd number instead.

Key questions

- What do you know about the ones digit of odd numbers?
- Where could the digit on that first card go – in the ones or tens? Why?
- How can we make a small number?
- How do we know that is the smallest odd number we can make?

Possible support

Some learners might benefit from having equipment to help them check whether a number is odd, for example Numicon, multilink cubes or counters that can be put in pairs.

Possible extension

Invite learners to explore what happens if they only have one set of 0–9 digit cards, so that they turn over one card at random and then have to decide which card from those remaining would make the smallest possible odd number.

2 Geometry

Unit plan

Topic	Approximate number of learning hours	Outline of learning content	Resources
2.1 3D shapes	4	Identify, describe, sort and name 3D shapes by their properties, including reference to number of faces, edges and vertices. Identify 3D shapes in familiar objects.	Learner's Book Section 2.1 Workbook Section 2.1 Additional teaching ideas for Section 2.1 Resource sheet 2A Resource sheet 2J
2.2 2D shapes and symmetry	4	Identify and sketch the reflection of a 2D shape in a vertical or horizontal line of symmetry on 2D shapes and patterns, including where the mirror line is the edge of the shape. Identify, describe, sort, name and sketch 2D shapes by their properties, including reference to regular polygons, number of sides and vertices. Recognise these shapes in different positions and orientations. Identify 2D shapes in familiar objects.	Learner's Book Section 2.2 Workbook Section 2.2 Additional teaching ideas for Section 2.2 Resource sheet 2C Resource sheet 2D Resource sheet 2E

CONTINUED			
Topic	Approximate number of learning hours	Outline of learning content	Resources
2.3 Fractions of shapes	5	Understand that an object or shape can be split into four equal parts or four unequal parts. Understand that a quarter can describe one of four equal parts of a quantity or set of objects Revise halved from Stage 1.	Learner's Book Section 2.3 Workbook Section 2.3 Additional teaching ideas for Section 2.3 Resource sheet 2B Resource sheet 2E Resource sheet 2F Resource sheet 2G Resource sheet 2H Resource sheet 2I
Cross-unit resources			
Learner's Book Check your progress **Digital Classroom:** Unit 2 slideshow: All about shapes, with accompanying activity sheet **Digital Classroom:** Pop-up image: Making symmetrical patterns **Digital Classroom:** Unit 2 activity Worksheet 2A Worksheet 2B Worksheet 2C Language worksheet 2A Language worksheet 2B			

Thinking and Working Mathematically questions in Unit 2

Questions	TWM characteristics covered
Learner's Book	
Exercise 2.1 question 1	Specialising, generalising, conjecturing, characterising, classifying
Exercise 2.1 Let's investigate	Specialising, generalising, characterising, classifying
Exercise 2.2 question 1	Specialising, generalising, conjecturing, characterising, classifying
Exercise 2.2 question 2	Specialising, generalising, conjecturing, characterising, classifying
Exercise 2.2 Let's investigate	Specialising, generalising, conjecturing, convincing, critiquing
Exercise 2.3 Let's investigate	Specialising, generalising, characterising, classifying

Questions	TWM characteristics covered
Workbook	
Exercise 2.1 question 2	Specialising, generalising, characterising, classifying
Exercise 2.1 question 3	Specialising, generalising, characterising, classifying
Exercise 2.1 question 5	Specialising, generalising, characterising, classifying
Exercise 2.2 question 2	Specialising, generalising, characterising, classifying
Exercise 2.2 question 7	Specialising, generalising, characterising, classifying
Exercise 2.3 question 3	Specialising, generalising, characterising, classifying
Exercise 2.3 question 5	Specialising, generalising, characterising, classifying
Exercise 2.3 question 7	Specialising, generalising, characterising, classifying

BACKGROUND KNOWLEDGE

In this unit learners will be asked to find shapes that are the same as, different from or similar to other shapes. They will be introduced to regular polygon shapes – where all of the sides are equal. For example, regular pentagons, hexagons and octagons.

Learners should explore shape when they can see, touch and feel properties. Organising a shape hunt, for example with instructions to find as many circles or squares, cubes or cylinders, is a good way to put shape in context with the world around us.

Exploring and working with shapes is a way in to problem solving. How do shapes or objects fit together? Which fit together with no spaces between them? Which don't? Why do you think this is?

In this unit, 3D shapes are introduced before 2D shapes. Learners will already be familiar with some of the names of 2D shapes covered in Stage 1, and they may begin to identify the face shapes seen in 3D shapes.

Digital Classroom: Use the Unit 3 slideshow to introduce the content of this unit. The i button will explain how to use the slideshow.

Supporting learners with the Getting started exercise

Some of the words that are used to describe shape may be unfamiliar to learners.

When talking to the class or a small group, focus on modelling them as sharp parts of the shape. Say 'one sharp corner is a vertex. For more than one of these we use the word "vertices"'.

Help learners to remember the names of the shapes by linking them with objects in the classroom. Label the objects by their name as well as by the name and the properties of the shape.

Make a large paper copy of each 2D shape that is being discussed. Display it with its correct mathematical name. Refer to the display when you talk about 2D shapes, modelling correct pronunciation.

TEACHING SKILLS FOCUS

Active learning

Active learning is an approach to education that encourages learners to be active participants in their own learning rather than simply receiving information. Learners need to understand what the aims of the lesson are and try to construct their own meaning from the information they are given. Learners need to be aware of how they think and their own strategies for learning.