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CAMBRIDGE
Primary Mathematics

Teacher's Resource 1

Cherri Moseley & Janet Rees

Second edition   Digital access

Cambridge Assessment
International Education

Endorsed for teacher support

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Primary Mathematics

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> 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 International 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 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 through Cambridge GO, including extra teaching guidance and downloadable resources.

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 objectives and success criteria as well as an array of assessment techniques, including advice on self and peer assessment.

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

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

We hope you enjoy using this course.

Eddie Rippeth

Head of Primary and Lower Secondary Publishing, Cambridge University Press

› About the authors

Cherri Moseley

After teaching in a range of primary schools, Cherri became a mathematics consultant, working for a range of providers and independently. She has also worked with a wide range of publishers to write a variety of mathematics resources for teachers. For several years, Cherri led mathematical videoconferences with numerous schools around the world for Motivate, part of the Cambridge Millennium Mathematics Project, and has twice travelled to Africa to work with disadvantaged teachers to develop their mathematics subject knowledge and teaching. She has also visited schools in Hungary and Portugal to explore teaching methods and approaches. Cherri is an active member of the Mathematical Association. She is a member of the Primary Group and Senior Editor of *Primary Mathematics*, the Mathematical Association's journal specifically for those interested in primary mathematics education.

Janet Rees

Janet was a teacher and then head teacher of both mainstream and special units, working with children with varying needs, before becoming 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, 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 in the United Kingdom 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

Cover to come

The Learner's Book is designed for students to use in class with guidance from the teacher. It contains sixteen units which offer complete coverage of the curriculum framework. A variety of investigations, activities, questions and images motivate students 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.
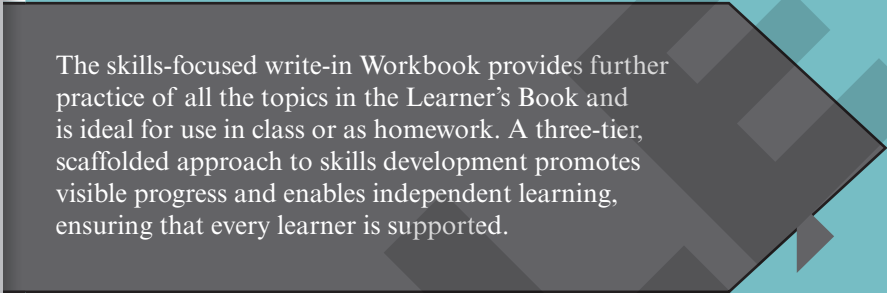
The Teacher's Resource is the foundation of this series and you'll find everything you need to deliver the course in here, including suggestions for differentiation, formative assessment and language support, teaching ideas, answers, tests and extra worksheets. Each Teacher's Resource includes:

- a print book with detailed teaching notes for each topic

- a Digital Teacher's Resource with all the material from the book in digital form plus editable planning documents, extra guidance, downloadable worksheets and more.
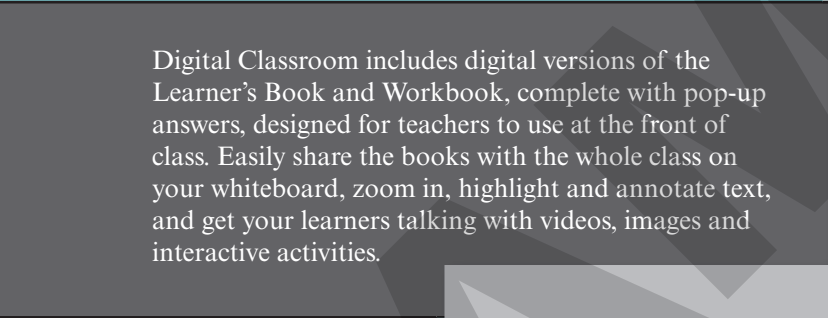
Cover to come

Cover to come

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.

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.

Cover to come

screen grab

A letter to parents, explaining the course, is available to download.

> 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 resources.

There are **teaching notes** for each unit of the Learner's Book. Each set of teaching notes contains the following features to help you deliver the unit.

At the start of each unit there is a **unit plan**, which summarises the topics covered in the unit, including the approximate 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
Counting sets of objects	3	Linking the value of numbers to quantities through counting. Introducing 0.	Learner's Book Section 1.1 Workbook Section 1.1 Resource sheet 1A 1 to 5 spinner templates

BACKGROUND KNOWLEDGE

The **Background knowledge** feature explains the 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 questions in the Learner's Book.

TEACHING SKILLS FOCUS

Each **Teaching skills focus** feature covers a different teaching skill and suggests how it can be implemented in the unit.

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

LESSON PLAN

At the start of each section, the **Lesson plan** table includes the learning objectives, learning intentions and success criteria that are covered in the section. You may wish to use these in your lesson planning.

LANGUAGE SUPPORT

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

There are often **common misconceptions** associated with particular learning topics. These are identified in a table, along with suggestions for eliciting evidence of these misconceptions in your class and suggestions for how to overcome them.

Misconception	How to elicit	How to overcome
Learners miscount because they do not arrange objects in a row or pattern and therefore include the same object twice or miss it altogether.	Give learners small collections to count.	Encourage learners to touch and move each object as they count it. This could be counting from one container to another. Slowing down and exaggerating the movement should help. Then encourage learners to arrange objects in a row, on a ten frame or in another pattern to support counting.

For each topic, there is a selection of **starter ideas**, **main teaching ideas** and **plenary ideas**. There are additional ideas provided for download in the digital edition of the book that you have access to with this resource. 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.

CROSS-CURRICULAR LINKS

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

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. There is a list of all of these questions and their characteristics that you can download from the **Introduction to Thinking and Working Mathematically** notes in the Digital Teacher's Resource. Within the teaching notes for each section, we have selected one question from each exercise in the section **Guidance on selected *Thinking and Working Mathematically* questions**, which identifies one of these questions from the Learner's Book section and provides more detail about the skills that it supports.

The teaching notes include a range of **downloadable resources**, which are provided as both PDF and Word files so that you can edit them as you choose.

- **Language worksheets:** these worksheets provide language support and can be particularly helpful for EAL learners.
- **Worksheets:** these worksheets are provided in variations that cater for different abilities.
- **Photocopiable resource sheets:** these can include templates and any other materials that support activities given in the teaching notes.

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

You will also find **answers** to the Learner's Book and Workbook questions at the end of this resource.

> 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.orglprimary to find out more.

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

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

- Number
- Geometry and Measure
- Statistics and Probability.

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

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

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

> About the assessment

Information concerning the assessment of the Cambridge Primary Mathematics curriculum framework is available on the Cambridge Assessment International Education website: www.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 1. Throughout the exercises in the Learner's Book and the Workbook, we have added this ◄ icon alongside questions that can be used by you with your learners to develop the Thinking and Working Mathematically characteristics. There is a list of these questions and their intended characteristics in the introduction to this resource.

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

Specialising and generalising

Use an example		Test an idea
	Specialising and generalising	
Say what would happen if . . .		Give an example
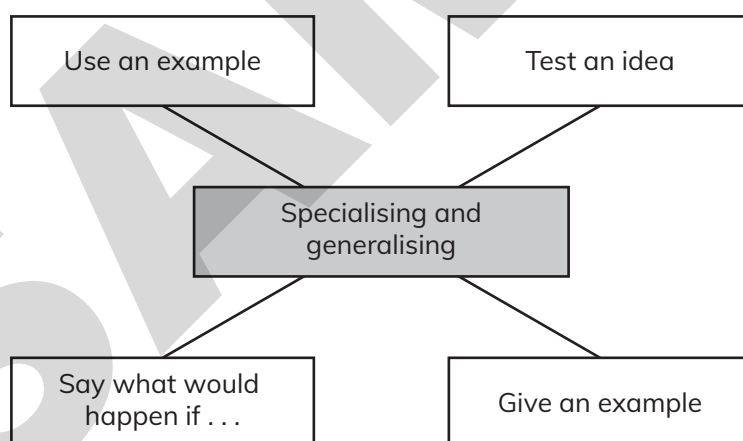
Specialising

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: When building a tower using 3D shapes, learners are discussing, exploring and agreeing on the features of different shapes in order to make the tallest tower possible.

Learners show they are **specialising** when they choose 3D shapes and check to see whether they can be used to build the tower.

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: Working with a partner, each learner takes a turn to pick a shape out of a bag, show it and discuss its properties.

Using the attributes of the shapes, learners can sort or group them according to specific maths criteria such as edges, faces or surfaces and identify a shape that doesn't fit in a group.

Learners will show they are **generalising** when they notice that all the shapes in a set have the same criteria and can be used to make rules or patterns.

SENTENCE STARTERS

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

Conjecturing and convincing
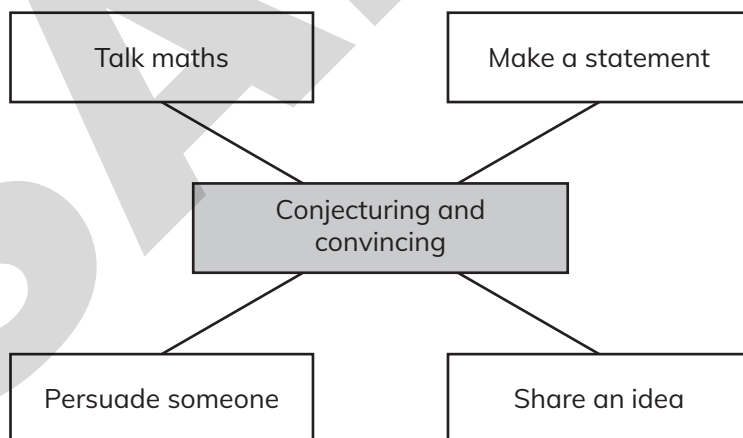
Conjecturing

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: When learners are working with fractions and are folding and cutting different shapes into two equal pieces, using those to make patterns, they will be able to ask questions of their partner and give ideas of their own.

Learners will show they are **conjecturing** when they offer ideas, such as suggesting a square always follows a triangle.

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: When working and ordering three different coloured cubes, learners are asked to find as many different ways of ordering them as they can with no pattern repeated and then present the evidence to justify their answers.

Learners will show they are **convincing** when they can offer proof that supports their conjecture.

SENTENCE STARTERS

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

Characterising and classifying

```
┌──────────────────────┐        ┌──────────────────────┐
│    Spot a pattern    │        │ Organise into groups │
└──────────────────────┘        └──────────────────────┘
              │                              │
              └──────────────┬───────────────┘
                  ┌──────────────────────┐
                  │  Characterising and  │
                  │     classifying      │
                  └──────────────────────┘
                             │
                  ┌──────────────────────┐
                  │ Say what is the same and │
                  │    what is different    │
                  └──────────────────────┘
```
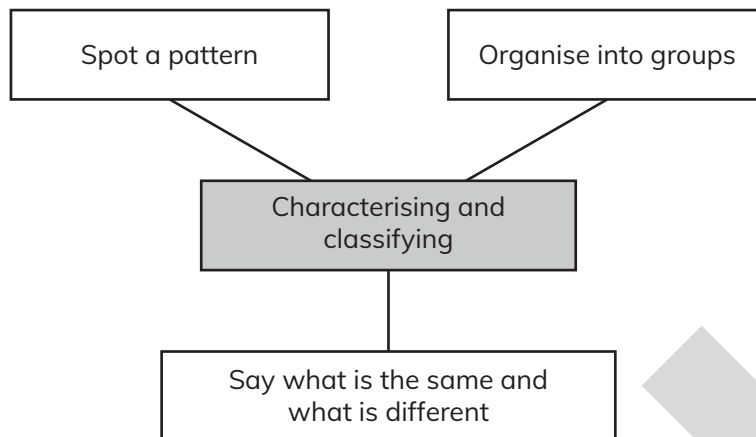
Characterising

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

Example: If the total number of objects can be counted in twos (pairs), then it is an even number. Odd numbers have an extra one without a pair.

Odd and even numbers alternate: odd, even, odd, even and so on.

Learners will show they are **characterising** when they identify what is the same about even numbers.

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 to their mathematical properties. They use Carroll and Venn diagrams.

Example: Sort the bugs into a Venn diagram in 2 different ways.

For example: cannot fly or 6 legs.

Learners will show they are **classifying** when they sort the bugs into those that show a positive and those that show a negative.

Critiquing and improving

```
┌─────────────────┐          ┌─────────────────┐
│  Find the error │          │ Correct the error│
└─────────────────┘          └─────────────────┘
          \                   /
           \                 /
         ┌─────────────────────┐
         │   Critiquing and    │
         │     improving       │
         └─────────────────────┘
```
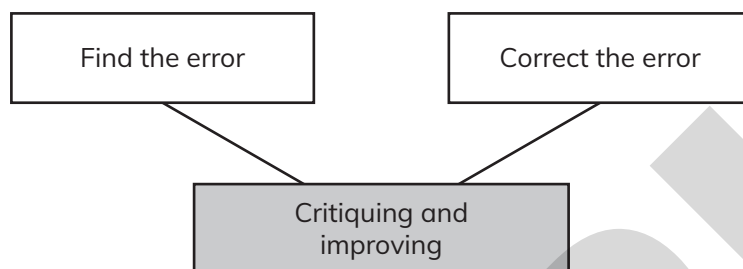
Critiquing

Critiquing involves comparing and evaluating mathematical ideas for solutions to identify advantages and disadvantages. Learners compare methods and ideas by identifying their advantages and disadvantages.

Example: Sofia and Marcus each recorded a way to get to 15. Discuss which method you think is best and why.

Sofia recorded: $10 + 5 = 15$
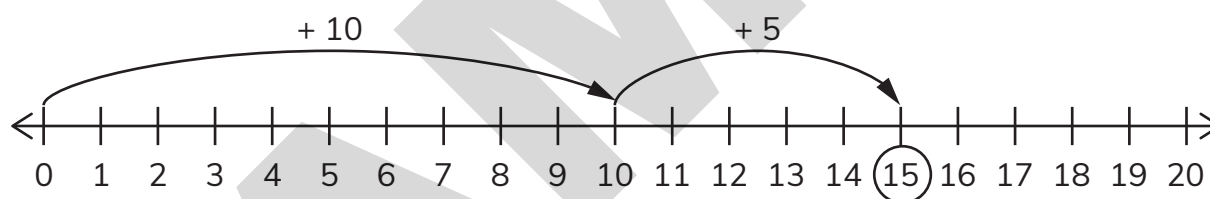
Marcus recorded: $2 + 3 + 2 + 3 + 2 + 3 = 15$
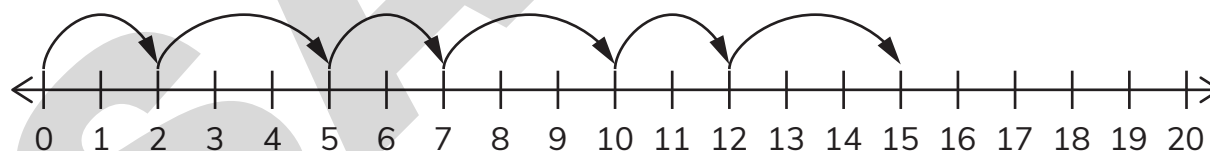
This question provides an opportunity for learners to practise **critiquing** when they are asked to compare different methods, discussing advantages and disadvantages. Sofia used a jump of 10 and a jump of 5 to get to 15. Marcus suggested a series of alternate jumps of 2 then 3.

Learners may comment that Sofia's method has the advantage of being familiar and efficient. They may comment on the pattern of Marcus' jumps, remembering that $2 + 3 = 5$ but also comment that its disadvantage is that it is not an efficient method.

SENTENCE STARTERS

- Have you tried . . .

- It might be better to . . .

Improving

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

Example: Are they all possible?
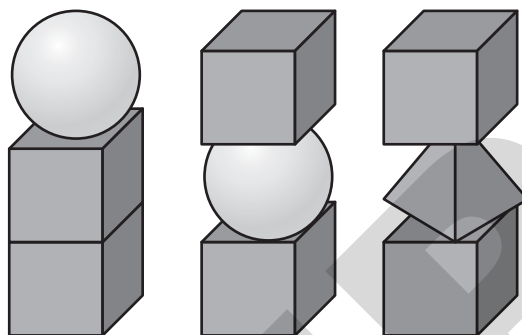
Learners are **improving** when they correct the models.

SENTENCE STARTERS

- . . . fit together and balance because . . .

- . . . do not fit together and do not balance because . . .

› 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 pedagogical practice 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 practice 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 what their ability, interest or context, make progress towards their learning outcomes.

It is about using different approaches and appreciating the differences in learners to help them make progress. 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, students 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.

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 Examinations.*

❯ 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.

For more guidance on successfully implementing active learning strategies in this course, please visit our website and explore our Setting up for Success Workshop Packs.

A blank Lesson Plan template is available to download to help planning using this approach.

> 1 Numbers to 10

Unit plan

Topic	Approximate number of learning hours	Outline of learning content	Resources
1.1 Counting sets of objects	4	Linking the value of numbers to quantities through counting. Introducing 0.	Learner's Book Section 1.1 Workbook Section 1.1 Resource sheet 1A Resource sheet 1B Resource sheet 1D Resource sheet 1E Resource sheet 1F Resource sheet 1G Resource sheet 1H Resource sheet 1I Resource sheet 1J Worksheet 1A Worksheet 1B Worksheet 1C Language worksheet 1A Language worksheet 1B Additional teaching ideas for Section 1.1
1.2 Say, read and write numbers to 10	4	Using number rhymes to help recall and use the correct order of the number words.	Learner's Book Section 1.2 Workbook Section 1.2 Resource sheet 1C Resource sheet 1D Resource sheet 1M Additional teaching ideas for Section 1.2 **Digital Classroom:** Interactive number track

1.3 Comparing numbers	4	Comparing small quantities using more than, less than, greater than, fewer than and the same as.	Learner's Book Section 1.3
			Workbook Section 1.3
			Resource sheet 1D
			Resource sheet 1E
			Resource sheet 1F
			Resource sheet 1J
			Additional teaching ideas for Section 1.3
1.4 Number words	4	Learning the written word for numbers to 10, including zero.	Learner's Book Section 1.4
			Workbook Section 1.4
			Resource sheet 1D
			Resource sheet 1F
			Resource sheet 1G
			Resource sheet 1K
			Additional teaching ideas for Section 1.4
1.5 Odd and even numbers	4	Exploring odd and even numbers through making pairs and looking at the pattern of the numbers.	Learner's Book Section 1.5
			Workbook Section 1.5
			Resource sheet 1B
			Resource sheet 1D
			Resource sheet 1G
			Resource sheet 1L
			Additional teaching ideas for Section 1.5
Cross-unit resources			
Digital Classroom: Unit 1 multimedia enhancement **Digital Classroom:** Unit 1 activity Learner's Book Check your progress Language worksheet 1A Language worksheet 1B			

Thinking, Working Mathematically questions in Unit 1

Questions	TWM characteristics covered
Learner's Book	
Exercise 1.1 question 7	generalising
Exercise 1.1 question 8	specialising, generalising
Exercise 1.2 question 6	generalising
Exercise 1.2 question 7	generalising

Exercise 1.3 question 5	specialising, generalising, conjecturing
Exercise 1.3 question 8	generalising
Exercise 1.3 Let's investigate	specialising, generalising, conjecturing
Exercise 1.4 question 6	generalising
Exercise 1.4 Let's investigate	conjecturing, convincing
Exercise 1.5 question 2	generalising
Exercise 1.5 question 3	generalising
Exercise 1.5 question 4	generalising
Exercise 1.5 Let's investigate	generalising, conjecturing
Exercise 1.5 question 5	conjecturing
Workbook	
Exercise 1.1 question 3	specialising, generalising
Exercise 1.1 question 7	specialising, generalising, conjecturing
Exercise 1.1 question 8	specialising, generalising, conjecturing
Exercise 1.2 question 5	specialising, generalising
Exercise 1.2 question 7	specialising, generalising
Exercise 1.2 question 9	specialising, generalising
Exercise 1.3 question 1	specialising, generalising
Exercise 1.3 question 6	specialising, generalising
Exercise 1.3 question 12	specialising, generalising
Exercise 1.4 question 4	specialising, generalising
Exercise 1.5 question 1	specialising, generalising, conjecturing, convincing
Exercise 1.5 question 6	conjecturing, convincing
Exercise 1.5 question 7	conjecturing, convincing

BACKGROUND KNOWLEDGE

This unit teaches learners how to count objects and actions up to 10. Learners will develop their understanding of the first three counting principles:

- The one-one principle. Learners must say only one number name for each object they are counting. Pointing to or touching each object as they say the number names in the correct order is important as it helps to ensure that all the objects in the set are included in the count.
- The stable-order principle. Learners must say the number words in the correct order. At first, the words may be said with little understanding of what they mean.
- The cardinal principle. Over time, learners will recognise that the last number said tells them how many objects they have counted.

Learners will also recognise that they can count objects and actions in any order, the total will still be the same.

As learners develop some understanding of the value of each of the numbers to 10, they will begin to be able to compare them and explore simple patterns.

These are key early steps toward developing a sense of number. The deeper the understanding of single-digit numbers and 10, the easier it will be to extend understanding to the rest of our number system. For this reason, the first half of the year explores numbers to 10, extending to 20 in the second half of the year.

CONTINUED

Digital Classroom: Use the multimedia enhancement to introduce the different ways that numbers are used, for example, as labels or to show how many items there are. The i button will explain how to use the multimedia enhancement.

Supporting learners with the Getting started exercise

If learners struggle with the Learner's Book questions, provide more experience with numbers to 5. Counting to at least 5 should be secure before learners move on to counting to 10.

- Use the *Cambridge Primary Mathematics Starter Books, A, B and C.* Book A focuses on numbers to 5, Book B focuses on numbers to 7 and Book C focuses on numbers to 10. Some activities overlap with the content in Unit 1, making the books a useful source of other activities.
- Use **Resource sheet 1A: 1 to 5 spinner templates** for learners to spin, say the number and count out that many objects.
- Use **Resource sheet 1B: Monster order** for learners to order numbers to 5.

TEACHING SKILLS FOCUS

Manipulatives

Learners learn so much more and develop a deeper understanding if they explore and discover for themselves. 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 be counters, cubes, small stones, beans or something else. If possible, use small counting objects that link with any current topic. Each object represents one. To prevent misconceptions from developing, use only small whole objects at this stage. Set aside one session for learners to play with manipulatives before expecting them to use these to support their learning. Work alongside the learners, making suggestions but not doing it for them. Watching

someone else moving objects around is not enough – learners need to experience this for themselves.

Pictures within the Learner's Book and Workbook reflect the classroom experiences of the learners. Encourage learners to get out similar materials (if available) 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? (More on this in Unit 3.)
- If colleagues came into your classroom, could they tell that learners were engaged in mathematics?

1.1 Counting sets of objects

LESSON PLAN

Learning objectives	Learning intentions	Success criteria
1Nc.01	• Count objects from zero to 10, recognising conservation of number and one-to-one correspondence.	• Learners can successfully count any collection of up to 10 objects. • They say the number names in order, say one number for each object and recognise that the last number said is the total. • Learners also recognise that the order they count the objects in does not matter.
1Nc.02	• Recognise the number of objects presented in familiar patterns up to 10, without counting.	• Learners are beginning to subitise, that is, know how many without counting. • Learners recognise familiar patterns of objects on a ten frame or in a domino pattern and smaller quantities in random arrangements.
1Nc.03	• Estimate the number of objects or people (up to 10) and check by counting.	Learners are beginning to get a sense of numbers and can give a sensible estimate of how many when they cannot immediately subitise.
1Np.01	• Understand that zero represents none of something.	Learners can label an empty box, a blank domino and other examples with 0.

LANGUAGE SUPPORT

Learning a new word or phrase in mathematics is just the same as learning a new word when speaking or writing. Draw learners' attention to the word and explain its meaning. Say it and write it, or point out the written word. Then model its use and encourage learners to use it appropriately. Reading a word is usually easier than writing it at first. Provide learners with a copy of the word for them to copy when writing, but gradually remove this support.

Estimate: a guess that is influenced by what you know already

How many are there?: a question asking you to find out how many objects are in the set

Row: a set of objects or pictures arranged in a line

Set: a group of things

Subitise (or subitize): know how many without counting due to familiar pattern layouts

Total: how many there are altogether

Common misconceptions

Misconception	How to elicit	How to overcome
Learners miscount because they do not arrange objects in a row or pattern and therefore include the same object twice or miss it altogether.	Give learners small collections to count.	Encourage learners to touch and move each object as they count it. This could be counting from one container to another. Slowing down and exaggerating the movement should help. Then encourage learners to arrange objects in a row, on a ten frame or in another pattern to support counting.
Learners do not recognise that the last number said is the total. When asked how many, they count again.	When you ask learners to get you four of something and they present a different quantity.	Practise counting, including placing objects in a row alongside a number track. Focus on the last object, saying, for example '1, 2, 3, 4. That's 4 altogether.', with finger resting on the last object or the number on the number track.

Starter idea

What is inside? (10 minutes + 10 minutes Getting started exercise)

Resources: Box or gift bag with some objects inside. No more than 5 of any set, for example 1 key, 2 pencils, 3 large buttons, 4 small toys and 5 bricks. Alternatively, link the objects to your current topic.

Description: During this activity, give learners the opportunity to talk about their own experiences of numbers. Support learners to recognise when a number has been used for counting and when it is just a label.

- Tell the learners that you found this box (or bag) but you cannot remember what is in it. Tip the objects out onto a tray and ask learners to help you to put them into groups and count them.

- Ask a learner to find all the buttons (for example), show the class and then count them together. Repeat for the other objects. Focus on giving the learners who found the diagnostic check difficult, plenty of counting practice. As objects are counted, make a list on the board to remind yourself what was in the box. When all objects are counted, read the list together.

- Look out for learners who recognise the numbers and those who find this difficult. Ask questions such as 'How many buttons are there?' to assess recognition of numbers to 5.

After this activity, ask the learners to 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

How many are there? (40 minutes)

Learning intention: Learners can count a collection of up to ten objects correctly by arranging objects in a row and touching or pointing to each object in turn as they count. Learners say one counting number for each object and in the correct order.

Resources: Small counting objects, small pots, sets of Resource sheet 1D: 0 to 10 number cards (remove 0).

Description: This activity is good for counting to find out how many, including reinforcing that the last number said is the total.

- Show learners a small quantity of objects, say five, in the palm of your hand. Explain that you would like to find out how many there are, to know if you need to get any more.

- Deliberately miscount, saying the same number twice, missing one out or something else. Ask the learners to explain where you went wrong.

- Suggest that if you line the objects up in a line it will be easier to find out how many there are.

- Touch each object as you count with the learners.

- Repeat with the same objects but in a different order to show that it does not matter which object you start with the total is the same. You could also spread them out or bunch them together to show that the total stays the same.

- Give the learners small collections of up to ten objects to count, with each set in a pot. Set up the collections so that each group has the same objects, for example two beans, three counters, four linking cubes, five buttons and so on.

- Give each group of learners a set of 1 to 10 cards. As you move around the groups, ask learners to label their collections with a number card.

- Ask learners to spread out or bunch up the objects they have just counted, then ask if they need to count again. Check that learners recognise nothing has changed, so the total is the same.

Carry out formative assessment by observing learner's counting strategies. If necessary, support learners to put objects in a line, touch or move them as they count. Use your observations to decide whether learners are ready to move on to the next part of the activity.

Give learners lots of opportunity to count objects in further sessions. After counting a given quantity, learners can move on to taking a given number from a larger collection, for example, seven buttons from a box of buttons.

- Show learners how to find Exercise 1.1 question 1 in the Learner's Book.

- Invite a learner to choose which set of pictures to count. Count together, with everyone touching each picture in turn. Agree how many. Show learners the matching number and ask them to find that number from the set of number cards.

- Repeat with a different set. Then ask learners to work in pairs, taking it in turns to choose which set to count and find the matching number.

After this activity, learners could try Learner's Book Exercise 1.1, revisiting question 1 and moving on to question 2 and Workbook Exercise 1.1 questions 1 and 4.

Answers: Collections are correctly counted. Learners are beginning to select the correct number to label each collection.

> **Differentiation ideas:** Give learners who struggle smaller collections to count, working with numbers up to 5 before extending gradually to 10. To challenge some learners, ask questions such as 'What if there was another one? How many would there be then?'

Introducing the ten frame (40 minutes)

Learning intention: Recognise the number of objects presented in familiar patterns up to 10, without counting. Learners can use the ten frame to support counting and begin to recognise quantities on this layout without counting.

Resources: Resource sheet 1D: 0 to 10 number cards, Resource sheet 1E: 0 to 10 ten frame cards, Resource

sheet 1G: Ten frames, Resource sheet 1H: 0 to 10 spinners, a range of counting objects including counters and cubes.

Description: The ten frame is a useful tool for organising objects when counting them. It ensures objects are placed in a line. Using a consistent layout on the ten frame will build recognition of quantities without counting.
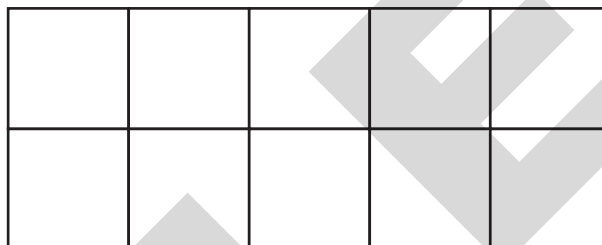
- Show the learners a ten frame without naming it. Count the spaces together and then explain that it is called a ten frame because if you put one object in each space a full ten frame always has 10 objects. Explain that the ten frame is also useful for seeing how many there are quickly. As learners get used to seeing objects in a ten frame, they will not always need to count.

- Place a counter in the first space (top left), check that everyone can see one counter. Explain that if learners always start in the same place, they will find it easier to see how many there are.

- Repeat for two counters, then three, adding counters along the top row.

- Once the learners have seen three counters in a row and identified that as 3, move the counters to random places on the ten frame. Check that learners can see that it is harder to tell how many there are when the objects are in random positions.

- Return the counters to their original positions. Continue to 5, emphasising that 5 is a full top row. Continue to 6, focusing on 5 and 1 more. Continue to 10, emphasising that the ten frame is full so there are 10 objects. You could also mention that there are two rows of 5, 10 altogether.

- Show learners a ten frame with no counters on. Introduce 0 as the number for none. There are no counters on the ten frame, so there are 0 counters. Show learners the 0 number card.

- Give pairs of learners sets of Resource sheet 1E: 0 to 10 ten frame cards.

- Ask learners to put these in order, starting with 1 counter, then 2 and so on, counting to check.

- Ask learners to place the matching number on the ten frame. Give learners some copies of Resource sheet

1G: Ten frames. Using Resource sheet 1H: 0 to 10 spinners, learners can then take it in turns to spin the spinner and place that many objects on the ten frame, using the ordered set for support. Partners can check that the correct number of objects has been placed on the ten frame before taking their own turn. Learners should always start from the top left, completing the first row before moving on to the second row.

- As learners work, listen out for those who are beginning to know how many without counting. For example, if a learner spins 6, do they first put a counter on the left-hand side of the bottom row and then fill the top row. Ask the learner how they knew that would be 6 objects. These learners are demonstrating metacognition as they have evaluated their learning and made changes to their behaviour.

After this activity, learners could try Learner's Book Exercise 1.1 question 3.

Answers: Ten frame layout used to support counting and some learners are beginning to recognise how many there are without counting.

> **Differentiation ideas:** Some learners will benefit from using a 1 to 5 spinner first, focusing on the top row of the ten frame only. Encourage learners who find this straightforward to place what would be the last counter in the ten frame first, then back fill. Are the learners correct or do they need to make an adjustment?

Plenary idea

Say how many without counting (10 minutes)

Resources: Set of Resource sheet 1E: 0 to 10 ten frame cards, Resource sheet 1F: 0 to 9 domino pattern cards, Resource sheet 1J: 0 to 10 random spot cards.

Description:

- Arrange the cards in random order, mixing the random, ten frame and domino layouts.
- Show each card asking learners to quickly call out how many there are.
- After running through all the layouts once, choose some cards and ask learners to explain what they see. For example, in the ten frame layout for 8, do they see a 5 and a 3, or 6 and a 2, or something else? For the domino layout for 8, do they see two rows of 3 and two ones or something else?

The ten frame is more structured and perhaps has a 'right' answer, but that is less true of the dominoes and random layouts. Learners need to begin to see smaller numbers within the whole, ready for addition and number bonds.

> **Assessment ideas:** Do learners quickly recognise layouts? Repeat layouts that learners find difficult more often, pausing to count to reinforce how many there are. Are learners beginning to see smaller sets within sets? Praise all comments as they are all equally valid.

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.1 question 8

Estimating uses all of a learner's current number skills. Through counting objects and looking at patterns, learners are beginning to understand what is meant by each number. They are generalising when they apply the number to the set, regardless of what the set contains. When learners estimate, they are matching what they see to their internalised ideas of how many each number represents. At first, this will be difficult because the learners' ideas of number are still being developed. Many learners want to be right and find it hard to resist simply counting. They are also conjecturing that what they see matches their idea of a particular number, when the learner's understanding of that number is still developing. Estimates are likely to be rather different to the actual count, but will improve over time.

It is reasonable for estimates to be very different to the actual count at first. Learners will quickly count small numbers of quantities, so it is better to ask for estimates for 5 or more objects. Always follow up an estimate with counting. Some learners will find it helpful to have a known pattern within sight when they estimate so that they can compare what they see with the pattern.

CROSS-CURRICULAR LINKS

There are objects to count everywhere. Count objects linked to a particular topic, for example, seeds for a growing topic. Whatever learners are counting, encourage the use of the ten frame or the domino layout to confirm the count or to enable the learner to see how many there are without counting.

Homework ideas

1   Ask learners to count at home and report back what it was they counted. Did they put objects in

a row, a ten frame layout or a domino (or dice) layout to check? Give learners the opportunity to demonstrate what they did if possible.

2   Parents and carers may not have seen a ten frame before. Give learners a ten frame to take home. Ask them to explain to their parent or carer why it is called a ten frame and how it helps them to count.

1.2 Say, read and write numbers to 10

LESSON PLAN

Learning objective	Learning intentions	Success criteria
1Ni.01	• Recite, read and write whole numbers from 0 to 10.	• Learners can say some number rhymes. • Learners can count to 10 and find a missing number. • Learners can read and write the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.

LANGUAGE SUPPORT

After: behind, next in place

Before: in front of, previous in place

Between: in the space separating at least two objects or numbers

Count: say the number names in the correct order, often to find out how many objects

Next: beside, usually after

Number: a label that tells you how many objects in the set

Order: know what comes before and after

Point: put a finger on or close to something to draw attention to it

Track: the counting numbers in order, one number in each space

Common misconceptions

Misconception	How to elicit	How to overcome
Learners say the numbers in random order.	Ask learners to say what comes next in a number rhyme. Ask learners to count from 1 to 5, later 1 to 10 without using a number rhyme.	Ask learners to use a number track for support, working from left to right and putting a finger on each number as it is said.
Learners repeat or miss out a number when counting.	Ask learners to say what comes next in a number rhyme. Ask learners to count from 1 to 5, later 1 to 10 without using a number rhyme.	Start to repeat or miss out a number rhyme verse, then stop, asking learners to explain what you have done wrong. Encourage learners to use a number track for support, working from left to right and putting a finger on each number as it is said.
Learners reverse digits such as 3, making a 3 look like 5.	Ask learners to record their count.	Encourage learners to trace over large numbers made from tactile paper, plastic or wood. Give learners a number track to copy from.

Starter idea

Number rhymes (10 minutes)

Resources: Resource sheet 1D: 0 to 10 number cards, Resource sheet 1M: Number rhymes Units 1 and 2 and any props needed to act out the rhyme.

Description:

- Share a familiar number rhyme with the learners, one they are likely to have learned in kindergarten or preschool. Act out the rhyme using props and number cards to link what is said with how the number is written.

- Start with rhymes that count forward in ones from 1 to 5, then 1 to 10. Ask learners to draw that number in the air and later on a mini whiteboard.

- Show learners how to find the number rhyme in Exercise 1.2 question 1 in the Learner's Book.

- Say the rhyme together, asking learners to point to each number as it is said or to show that many on their fingers.

- Give learners the opportunity to say their favourite rhyme to their partner, as in Exercise 1.2 question 2.

- When a number rhyme is established, make a deliberate mistake such as repeating a verse or missing out a verse. If learners do not tell you that something was incorrect, stop and ask them to explain where you went wrong.

- Complete the rhyme correctly together.

- You will need to revisit this starter several times so that learners become confident in the order of numbers from 1 to 10. Look out for learners joining in and those who are not. Clarify the order of the numbers by sometimes stopping and asking which number is next.

Main teaching idea

Numbers and the number track (40 minutes)

Learning intention: Say the numbers in order, begin to read the numbers on a number track, begin to write numbers.

Resources: Number rhyme (or song or story) illustrations or resources, 1 to 10 number track with each number covered up with an easily removed cover, mini whiteboards and pens (or paper and pens).

Description: This activity is useful for linking the spoken word to the written number. The activity will also support the early writing of numbers as learners begin to record numbers.

- Say the beginning of a popular number rhyme together. Ask learners to tell you which number (or numbers) they said.

- Ask learners what the number 1 looks like. Invite some or all learners to write it in the air, on paper or on their mini whiteboards or the class board, depending on your available resources.

- Choose some of the written numbers and ask other learners if they think the number is correct.

- Explain that a number track has the numbers on it in order. Explain that when we count, we start with 1, so the number 1 is at the beginning of the track. This would be a good opportunity to explain that there is no 0 on a number track, because when we count objects, we start with 1.

- Remove the cover from a number on the number track to reveal the number. Check with learners that this is correct. You might ask learners to write it again now that they have the visual prompt.

- Repeat with 2 and 3, inviting a learner to reveal the number.

- Reveal the rest of the number track one number at a time, asking learners to read the number with you.

- When revealed, count along the whole track together.

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

You may need to repeat this activity several times. Use a different rhyme (or story).

Answers: Numbers correctly identified verbally and on number track. Numbers beginning to be written clearly.

> **Differentiation ideas:**

- Differentiation will occur through whom you choose to predict or write the number then reveal it. This could be a single learner, but asking different learners to do each part will extend your coverage. Target learners who found it difficult to identify a number in the Diagnostic check.

- Follow up questions such as 'Were you right?' and 'How do you know?' will encourage learners to explain their thinking, giving further opportunity to monitor understanding. To support learners who find this difficult, ensure that they have a copy of

the number track in sight. To challenge learners who find this straightforward, ask them more complex questions such as 'How do you know?'.

Plenary idea

Sorting number tracks (10 minutes)

Resources: Number tracks numbers 1 to 10, some with a range of errors and some correct number tracks.

Description:

- Give out number tracks, one per learner.

- Ask learners to identify the error on the track. Briefly share the different errors and list them: missing number, repeated number, swapped number (or numbers), correct number track.

- Identify an area of the room for each type of number track.

- Learners walk to the appropriate area and check each other's number tracks to ensure they have the same type of error.

- Give learners time to tell each other how to correct the error on their number track. You could count the learners in each area and conclude which error occurred the most often or least often.

- Bring the learners back together, collect the number tracks and repeat the activity, handing out the number tracks randomly. If there is enough time, you could extend discussions to who had the same error as last time.

› **Assessment ideas:** Peer assessment occurs when learners in each group check that others in the group have the same type of error and when they talk within the group about how to correct it. Look out for learners identifying the type of error quickly and those who need some support.

Ask learners to consider what it is that they know that helps them to notice the errors and also know how to correct them. This is metacognitive behaviour because learners are reflecting on their own learning.

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.2 Reflection

When using a number rhyme to recall the order of the numbers, learners are generalising, recognising that the numbers always come in the same order. When

learners realise what it is that helps them to identify the order of the numbers and share it with a friend, they are beginning to classify numbers and open themselves to other ideas. They may also critique what other learners do, comparing and evaluating methods. If learners like a different method that has been shared with them, they may choose to adopt that method themselves.

Within any discussion and sharing of ideas, there will be those who are willing to consider other methods and those who are not. Try not to be judgemental about this. Some learners may simply observe and later add a method to their own toolbox. Be a good example – tell learners that you found Sam's or Jo's method helpful and that you will use that yourself. Alternatively, explain that you did not really understand a particular method and you are sticking with the way you know.

CROSS-CURRICULAR LINKS

- Numbers are everywhere and we often use them without thinking. Encourage learners to notice numbers in all that they do. This could be page numbers in a reading book or topic book or in a newspaper or magazine read at home. Numbers could also be used to label classrooms or in playground markings. Encourage learners to be number detectives, noticing numbers in other areas of the curriculum.

- Number rhymes could link to English/literacy stories and other curriculum areas depending on the chosen rhyme or story.

Homework idea

Ask learners to notice numbers at home. Invite them to bring in an example of what they have noticed. This could include packaging with a number on, a newspaper or magazine with numbered pages, a photograph of something they noticed or something else. Set up a table for learners to place their examples on. Learners could ask each other about what they brought in.

1.3 Comparing numbers

LESSON PLAN

Learning objectives	Learning intentions	Success criteria
1Np.03	• Understand the relative size of quantities to compare and order numbers from 0 to 10.	Learners can compare quantities, initially by direct comparison then by number, recognising quantities that are more/greater, less/fewer or the same as another quantity.
1Np.01	• Understand that zero represents none of something.	Learners recognise zero as a quantity and can compare it with other quantities or numbers.

LANGUAGE SUPPORT

Model the use of the language with the learners. Repeat back a question or sentence using the correct language when learners are beginning to use these words. Sometimes ask questions using two or three of the new words such as, 'Is that more than, fewer than or the same?' to support learners to consider which word is correct.

Compare: check if a number or set is the same, fewer than or more than another set

Comparison: the act of comparing

Equal: another way of saying that two sets have the same value

Fewer than: when we compare sets or numbers, we use fewer than (or less than) to show which set has the least

More than: when we compare sets or numbers, we use more than (or greater than) to show which set has the most

Same: when we compare sets or numbers, both sets do not have a different number of objects

Common misconceptions

Misconception	How to elicit	How to overcome
Learners see more (or greater) and fewer (or less) as two different and separate things.	When learners have recognised one statement such as '4 is fewer than 6', ask learners to record a 'more than' statement using the same numbers.	Show learners how to physically swap the quantities over to generate the linked statement. Emphasise that the quantities have not changed.
Learners see quantities that are spaced apart as more or greater than those that are tightly grouped.	Set out the same quantity twice with different spacing. Set out two different quantities and give the lesser quantity greater spacing between the objects.	Ensure learners match objects one to one to directly compare quantities.

Starter idea

Using familiar language to explore *same* and *different* (10 minutes)

Resources: Two similar items of clothing, for example two T-shirts, but different colours, sizes and with different markings.

Description:

- Tell learners that we often compare things. We look at one thing and see how it is the same and different from another thing.

- Show learners two jumpers, T-shirts or other items of clothing and ask them to talk to their partner about what is the same and what is different about them.

- After a few moments, share ideas. Learners should recognise that the items are the same because they are both T-shirts (or whatever they are) but they are also different because one has words on the front and the other one does not or one is bigger than the other, depending on the differences.

- Explain that in mathematics, we look at how many are in a set and compare that with another set. Sometimes both sets will have the same number of objects in them. Sometimes they will have different numbers of objects in. Tell learners that they will be comparing the number of objects in each set in the next few lessons.

- Listen for learners using other comparison words such as *more* and *less* or *fewer* when they describe the features of the clothing. Use this as formative assessment, to inform you about which vocabulary to focus on in the following activities.

Main teaching idea

Direct comparison (40 minutes)

Learning intention: to directly compare two quantities, by matching one to one.

Resources: Counting corner materials from Section 1.2 or other small objects, two bowls for each pair of learners.

Description: This activity is good for comparing quantities directly and beginning to express those comparisons in mathematical sentences.

- Invite five learners to come to the front of the class, choosing either two boys and three girls or three boys and two girls.

- Ask each boy to stand next to a girl and any other boys or girls without a partner to stand on their own.

- Ask the rest of the learners if there are more boys than girls at the front of the class. Ask them to explain how they know. Since learners have been paired, it is easy to compare boys and girls.

- Ask if there are fewer boys than girls and link what the learners have said. For example, if there are more boys than girls, there are fewer girls than boys. Both statements are true at the same time.

- Now ask learners to work with a partner. Give each pair two bowls and ten objects.

- Learners take it in turns to put some objects in one bowl and the rest in the other. They then put the contents of each bowl in a line and compare them. Encourage learners to place the two lines next to each other, so they match up each item in one row with an item in the other row.

- Learners can then describe the comparison to each other, for example 'There were more cubes in the blue bowl this time.' As you move around the room, listen out for words such as 'fewer', 'less', 'more' and 'same'.

- Ask all the learners to pair up, a boy with a girl. Ask any learners who are left over to come to the front.

- Invite learners to describe what they see in a sentence. Sentences might include:

  There are more girls than boys in our class. There are fewer boys than girls.

- Explain that most people usually use 'less' in everyday life. This is correct when things cannot be counted, for example sand or water. For things that can be counted and for people, the correct mathematical word is 'fewer', for example, there are fewer boys than girls in our class.

After this activity, learners could try Learner's Book Exercise 1.3 questions 1, 2, 3 and 4 and Workbook Exercise 1.3 questions 1, 2, 3, 4, 5 and 6.

Answers: Learners compare sets of objects, verbalising their observations in mathematical sentences.

> **Differentiation ideas:** Encourage some pairs of learners to put a smaller number of objects, such as 1, 2 or 3, in one of the bowls. It is easier to compare amounts that are very different. Challenge other learners to count how many in each line once they have taken the objects out of the bowls and put them into lines, so that they can also say, for example, 2 is fewer than 8.

Plenary idea

Comparing numbers (10 minutes)

Resources: Set of 43 cards illustrating 11 ten frames using Resource sheet 1E: 0 to 10 ten frame cards, 10 domino layouts using Resource sheet 1F: 0 to 9 domino pattern cards, 11 random arrangements using Resource sheet 1J: 0 to 10 random spot cards and Resource sheet 1D: 0 to 10 number cards.

Description:

- Shuffle the set of Resource sheet 1F: 0 to 9 domino pattern cards and turn over the first two, displaying them with a space between.

- Learners must decide which wording belongs between the two cards. The learners have a choice of three statements to place between the two cards: *is greater than*, *is fewer than, is the same as*. Learners could offer suggestions to the whole class, work as two teams or work in pairs if there are sufficient sets of cards.

- This plenary can be repeated several times since the random nature of the cards displayed will make it different each time.

- If playing as a class, allow some selections to be made quickly to ensure the game is played at a good pace. Occasionally pause and ask questions such as, 'How do you know?' 'What makes you think that?' 'What if the cards where swapped over – which words would you choose then?'

⟩ **Assessment ideas:** Target questions as above to make learners think. Learners should be able to explain their thinking, but most learners will benefit from some practice. Support those who struggle by asking questions such as 'Why can't it be this one?' Eliminating what it cannot be will help learners to identify the correct response.

Are learners developing their understanding of making and expressing comparisons? If a similar error is being made repeatedly, think back to your explanations. Do you need to revisit them? Make sure you illustrate all explanations with physical examples and give the learners opportunities to create their own physical or pictorial examples.

Guidance on selected Thinking and Working Mathematically questions

Learner's book Exercise 1.3 Let's investigate

As learners work their way through the investigation, they will be conjecturing about what they have noticed as they look for a pattern. As learners identify a pattern,

they will continue the investigation, checking that the pattern continues to convince themselves that they are correct.

Support learners by encouraging them to record each answer. As they record 3, 4, 5, 6 . . . learners should notice that they are counting forwards each time they take another object for their collection.

Learners may find it hard to express what they notice and to summarise it. Support learners by asking questions such as 'How does how many you have change each time you take another object?'

Some learners will be able to generalise that adding one more makes the next counting number, though they may express that in different ways. Having completed the first part of the investigation, they may find the second part more straightforward and reach a similar conclusion about putting one back – taking one away makes the counting number before. Remember, learners have not yet explored addition and subtraction. They will have added and subtracted as they have carried out various activities but not in any formal way. It is therefore unhelpful to talk about adding and subtracting at this time. Instead, focus on *more than* and *fewer than*.

Some learners may benefit from having a number track nearby or by placing their objects on a ten frame to count them. As they progress through the activity, they may not remove the counters from the ten frame, simply placing one more directly on to the ten frame or removing one from it. To recognise a pattern, learners will need to focus on the number that they had and how that changed, so linking to the number track will be helpful. Ask learners to attach a peg to the number on the number track, then move it when they change the quantity. This is more secure than using a counter and having to move the peg along the track helps learners to focus on what changed.

CROSS-CURRICULAR LINKS

- Ask learners to look out for when they compare objects in other areas of the curriculum. When looking for what is the same and what is different, they may discuss features rather than quantities, so they are making different types of comparisons, but they are still comparing one thing or set with another thing or set.

- In later sessions, learners will compare lengths, heights, weights and capacities as well as quantities.

Homework ideas

1   Ask children to explore food packaging with numbers on, comparing the number contained within two multipacks. Learners need to work with numbers up to 10 and record their observations in sentences such as 'There are 6 chocolate biscuits and 4 apples. There are fewer apples than chocolate biscuits. 6 is more than 4.' Learners can bring in the empty multipacks and share their observations with the class.

2   Learners could use the items brought in as props for asking each other comparison questions. These could be, 'Can you find two packets that had the same number in them?', 'Can you find a pack which had fewer in than the pack of oranges?' and so on.

1.4 Number words

LESSON PLAN		
Learning objectives	**Learning intentions**	**Success criteria**
1Ni.01	• Recite, read and write number names and numbers from zero to 10.	• Learners can read the number words zero, one, two, three, four, five, six, seven, eight, nine and ten. • Learners are beginning to write the number names, though there may be some spelling errors.
1Np.01	• Understand that zero represents none of something.	Learners can label an empty box, blank domino or other examples with 0 or zero. They are beginning to recognise why there is no 0 on a number track or ten frame.

LANGUAGE SUPPORT	
In this section, learners are exploring numbers in words, a very language-based activity. Learners will link the number words with the counting support frameworks they already use: number track, ten frame and domino layout. This will help learners to develop recognition of the number words and how each word is written. Zero: 0 One: 1 Two: 2	Three: 3 Four: 4 Five: 5 Six: 6 Seven: 7 Eight: 8 Nine: 9 Ten: 10

Common misconceptions

Misconception	How to elicit	How to overcome
Number and number word mismatched as learner only refers to the initial letter of the number word.	Match numbers and number words.	Focus on the spelling of each word. Make other links between numbers and number words, for example seven is more than six and its word is longer.

Starter idea

Numbers in words (10 minutes)

Resources: Story with numbers in words, coins with words rather than numbers on if relevant, other examples of numbers in words, number track.

Description:

- Show the learners the number track and explain that the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 are often written as words.

- Show learners the number words in a story or on the front cover. Explain that reading numbers means being able to read them in words as well as in numbers.

- Pass around coins, books and other objects with number words so that learners can see for themselves that words, not numbers, have been used.

- Choose a familiar story that uses number words. Share a short extract with the learners, showing them what you saw that made you say a number. If there is time, list the numbers with the words next to them for all the learners to see.

- Focus on the fact that every number has its own word. Some start with the same letter, some do not. Learners must look at the whole word to be sure they have the correct word.

Main teaching idea

Number track match (40 minutes)

Learning intention: Match numbers and number words to develop recognition of number words. Learners are beginning to recognise some number words.

Resources: Resource sheet 1D: 0 to 10 number cards and Resource sheet 1K: 0 to 10 number word cards for each table, blank 11-space number tracks (large enough to write the number words on).

Description: This activity is useful for linking the number words to the relevant numbers, ensuring that learners focus on the whole word, not just the initial letter as some number words have the same initial letter.

- Count along the number cards together from 1 to 10.

- Ask learners where 0 belongs in the order of the numbers. Agree that it sits before 1.

- Explain that 0 isn't usually shown on a number track because the track is used for counting objects, matching one object to each space. The last number

matched gives the total. If there was a zero square, learners might make the mistake of matching the first object with zero.

- Position the 0 card before 1. Show the learners three objects, matching them to 0, 1 and 2 to show that the last number matched is 2, which is not correct, there are three objects. Go on to explain that it is still important to know how to write zero, so you have included the 0 card.

- Show learners the word zero, sound it out and say it together, then match with the number card.

- Repeat for all the number words until you have a number row and a matching word row.

- Count along the number row then the word row, checking that learners realise that they say the same thing whether they see the word or the number. We always say the number words in the same order when we count, just like the numbers.

- Give learners a blank number track with 11 spaces.

- Tell learners that they are going to complete their own number word track. This will help them to recall the number words. Remind learners that the first space is for zero. Provide sets of number word cards for each table.

- When the tracks are complete, bring the learners back together.

- Read along the number word track together. Then ask learners to point to 4 or 7 or a different number. Learners are likely to need to count along the track initially to identify the correct word, but this will improve over time.

- Ask learners what they could do if they wanted to use the word track to support counting objects. Elicit that zero is not needed, so it would be better folded behind 1 so that it does not affect the count.

After this activity, learners could try Learner's Book Exercise 1.4 question 1 and Workbook Exercise 1.4 questions 1 and 5.

Answers: Word number track completed correctly.

> **Differentiation ideas:** To support learners who find this difficult, give them 1 to 10 number tracks. Discourage learners from also numbering their number word track. If numbered, learners will rely on the number rather than trying to learn the number word.

To challenge more confident learners, ask them to check their spelling and correct as necessary.

Plenary idea

Number word action (10 minutes)

Resources: Large number word cards.

Description:

- Ask the learners what kind of actions they could do just where they are. Agree a list such as clap, click fingers, tap nose or toes, stand up, jump up and so on, as appropriate.

- Ask a learner to choose an action, for example clap.

- Display a number word and say, 'Clap this many times. Ready, go!' or something similar.

- Count to confirm if learners correctly identified the number word.

> **Assessment ideas:** Learners will notice if someone claps fewer or more times than others. Clarify with questions such as 'Did you read that as 5? It is 4, f-o-u-r.' Display that number card later with a different action, observing if the same learners are beginning to read it correctly. Learners who struggle need more practice with the number words, perhaps through the Learner's Book or Workbook activities.

Are learners beginning to recognise the number words? It is unlikely that all learners will recall all of them, but they should improve with time. Reading the words is easier than writing them initially. Learners may choose to practise reading the number words independently using a set of word cards or the materials they have prepared in sessions.

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.4 Let's investigate

Learners will be using metacognitive behaviour as they plan, monitor and evaluate their investigation. They may go on to make changes to their behaviour as the investigation progresses. When learners sort the words into the relevant sets, learners are specialising, choosing and testing an example to see if it satisfies or does not

satisfy the given specific mathematical criteria. Learners are also classifying as they create their sets.

Encourage learners to check what they have done. Learners could use one of their previously prepared resources for support. Look out for learners who get stuck. Ask them to explain what they have done so far. This will often be enough to clarify the learner's thinking and get them going again.

Draw learners together to ask what they found out. Do other learners agree or did they reach a different conclusion? Can pairs of learners who disagree convince the other pair that they are correct? This gives the opportunity for both critiquing and improving. Support learners to be gentle in their critiquing. We all make mistakes and get the wrong idea at times, but we can all improve.

CROSS-CURRICULAR LINKS

- Learners are likely to see number words in stories, on coins and banknotes or sometimes in instructions for other subjects.

- Share stories that include number words. Ask the learners to read the words with you and eventually independently.

- Learners should be well equipped to notice and read number words in a range of texts across the curriculum.

Homework ideas

1 Ask learners to look at coins and banknotes, exploring local currency and currency from English-speaking countries if available. Do they have words or numbers on them, or perhaps both? Learners could bring in any examples of local and foreign coins that they have.

2 Start a list of books with number words in. Invite learners to add the title of a relevant book they have read at home. Learners could also ask parents and carers to show them examples of number words in newspapers and magazines. When the newspaper or magazine is finished with, learners could bring it in to show the class or add to the class collection.

1.5 Odd and even numbers

LESSON PLAN

Learning objective	Learning intentions	Success criteria
1Nc.05	• Understand odd and even numbers as 'every other number' when counting, from zero to 10 and beyond.	Learners recognise odd and even numbers on a number track. They are aware that an even number of objects can be put into pairs with none left over but that an odd number of objects will always have one left over.

LANGUAGE SUPPORT

Learners may have heard the word *odd* used to describe something unusual so initially may be confused by its use here. Focus on establishing understanding of even numbers and then move on to odd numbers. Learners will already be familiar with *pair* and *pattern* but perhaps not in the more rigorous mathematical uses of the words. Model the correct use of the language yourself and regularly check understanding.

Even: a number that can be put into twos with none left over

Odd: one more or one fewer (less) than an even number

Pair: two things that go together

Pattern: regular arrangement, often repeated

Common misconceptions

Misconception	How to elicit	How to overcome
Learners confuse odd and even numbers.	Ask learners to give you an odd (or even) number.	Focus on what the words 'odd' and 'even' mean. Ask learners to show you whether a number is odd or even with objects. Work on developing recognition of the pattern of odd and even numbers on the number track.

Starter idea

Pairs (10 minutes)

Resources: Slides showing a range of paired items such as socks, gloves and shoes or the actual objects. Ensure that some slides or physical examples have an odd one as well as complete pairs.

Description:

• Explore each of the slides or sets of objects one at a time.

• Count the objects. Encourage comments recognising pairs and noting when there is one left over.

• Ask learners how they could make any slides with an odd one into complete pairs. Accept having one more or putting one away.

• Revisit each slide, drawing up a simple chart of 'pair numbers' and 'one left over numbers'.

• Look at the numbers on a number track and discuss the pattern. The 'one left over' numbers start at 1 and then every other number has one left over. The pair

numbers start at 2 and then every other number is a pair number. Every number is either a pair number or a 'one left over' number.

- Explain that in mathematics, the pair numbers are called *even* and the 'one left over' numbers are called *odd* numbers and that during the next few lessons, the learners will be finding out all about odd and even numbers.

- Ensure learners link pairs with even numbers and one left over with odd numbers.

Main teaching idea

Odd and even cubes (40 minutes)

Learning intention: To explore odd and even numbers through making pairs with cubes.

Resources: Lots of connecting cubes and Resource sheet 1D: 0 to 10 number cards for each pair.

Description: This activity is good for using manipulatives to understand a number idea.

- This activity works best if learners are sitting at tables or desks. Have plenty of cubes on each table as learners will eventually use 55 in their pair.

- Ask learners to work with a partner. Ask each pair to take a single cube and the number 1 card.

- Ask learners if 1 is odd or even. If necessary, ask if the cube is in a pair or on its own and remind learners that if a number of objects can be arranged in pairs with none left over, it is an even number. One cannot be arranged in a pair, so it is odd.

- Learners should place the cube on or next to the number card.

- Next, ask learners to take two cubes and join them together. Support learners to identify whether 2 is odd or even.

- Move on to three cubes. This time, learners can make one pair and have one cube left over, confirming that 3 is odd.

- Continue to 10. When learners have explored all numbers to 10, ask them to rearrange their number cards and cubes. Ask them to put together all the odd numbers on the left and all the even numbers on the right.

- Check that everyone has 1, 3, 5, 7 and 9 in their odd number set and 2, 4, 6, 8 and 10 in their even number set.

- Now tell the learners that one partner needs to count to 10 while the other calls out odd or even for each

number. This may be tricky to organise as a whole class, but it really reinforces the pattern of odd and even.

- Repeat, swapping learners. The whole class should hear: 1 odd, 2 even, 3 odd, 4 even, 5 odd, 6 even, 7 odd, 8 even, 9 odd, 10 even.

- Remind learners of the pattern they have said and ask them to tell you whether 0 is odd or even. The pattern shows that it is even, but it does not have any objects to put into pairs.

After this activity, learners could try Learner's Book Exercise 1.5 question 1 and Workbook Exercise 1.5 questions 1, 2, 3 and 4.

Answers: Learners are beginning to recognise and recall which numbers from 0 to 10 are odd and which are even.

› **Differentiation ideas:** To support learners who find this difficult, pair them with a partner with whom they will work well. This may not be someone from their usual friendship group. You could consider setting up maths partners, pairs who always work together in mathematics. Maths partners need to be willing to listen to each other. Each partner must be able to ask the other to explain and both must be willing to support each other as necessary without taking over.

To challenge learners who find this straightforward, ask them to demonstrate the odd and even count to the class, then support others to join in.

Plenary idea

Are you an odd class? (10 minutes)

Resources: None.

Description:

- Ask the learners if they are an odd class or an even class. Accept the answers given and then ask how the learners could prove what they have said. For example, if the learners say there is an odd number of boys in the class, ask the boys to stand in pairs and check if a boy is left over. Make sure you do this on a day when all are present. You could also take a photograph of the boys in pairs for a display.

- Repeat for the girls and for the whole class. Explore other suggestions too. These might include features of the room – does it have an odd number of doors, windows or lights? Although the numbers involved are likely to extend beyond 10, shift the focus to making pairs and whether or not there is one left over.

- Make a display with the relevant heading – 'We are an odd class!' Or 'We are an even class!' Or perhaps 'We are sometimes odd and sometimes even!', splitting the display into two parts.

> **Assessment ideas:** Although some learners may make incorrect suggestions, what matters is how these are proved. If, on pairing up the girls, there turns out to be an even number rather than an odd number, learners should accept their mistake and move on. Where both odd and even are suggested, showing which it is by pairing will clarify.

Are learners beginning to understand what is meant by an odd number and an even number? Do some learners need to return to pairing up cubes for the numbers 1 to 10 to remind themselves of what is meant by odd and even and the pattern of odd and even?

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.5 Let's investigate

Learners could write a list of what they notice. It will be useful to remind learners that 10 is an even number.

1, 9. Odd, odd

2, 8. Even, even

3, 7. Odd, odd

4, 6. Even, even

5, 5. Odd, odd

As they explore, learners are noticing and trying to locate a pattern. They may not have looked at the ten frames in any order, but they should notice that two odd numbers put together make 10 and two even numbers put together make 10. They are both specialising and generalising. Many learners will want to find out if this is always true by swapping numbers around. When they do this, they are losing the crucial 'make 10' criterion. They will discover that they can put an odd and even number together, but they cannot make a complete ten frame this way. Learners need to explore this for themselves in order to convince themselves.

Those learners who used ten frames with the counters drawn on will benefit from using those sets. They will see the quantity directly as well as whether it is an odd or even number. Learners using the plain sets have recognised the odd and even properties of the shape created.

Challenge some learners by saying that two odd numbers together make an even number and two even numbers together make an even number. Learners could

make a set of eight frames to explore this. Remember, learners have not yet explored addition, so should not be asked to record in a more formal way.

CROSS-CURRICULAR LINKS

- Numbers are everywhere. Often odd and even are used in some way but we rarely notice, for example, book page numbers. Even numbers are usually on the left and odd numbers on the right. This is because we start numbering on the first page with 1 and then progress from there. Learners can check that this is true for all printed materials.
- In science, learners often explore the characteristics of other creatures. When this involves the number of a particular feature, these are often even numbers. We have two eyes to give us a wide field of vision and two ears to ensure we can hear noises from all around us. Insects and other creatures have an even number of legs so they can walk straight. The same is true of wings. If legs and wings were not paired, it would be very difficult to control the direction of movement.
- Many everyday objects have things in pairs – two wheels on a bicycle, four wheels on a car. Learners could look out for other examples across the curriculum.

Homework idea

Ask learners to collect examples of odd and even numbers of objects at home. Fold a piece of paper in half. Label one half odd and the other even. Learners could draw or write on each side. Bunk beds are a good example of an even number. Stovetops usually have four cooking rings on them, but not always. Give learners the opportunity to share what they noticed.

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. Thei button will give you more information.

The **Look what I can do!** feature is intended to develop learners' ability to reflect on their learning and assess themselves. As a class, read each statement and ask learners to tick the circle corresponding to how they feel about it. The happy face means that they feel confident about the statement. The neutral face means that they are not confident or are unsure. Check learners' self-ratings and plan any follow-up actions.

> 2 Geometry

Unit plan

Topic	Approximate number of learning hours	Outline of learning content	Resources
2.1 3D shapes	5	Identify, describe and sort 3D shapes by their properties, including reference to the number of faces, edges and whether faces are flat or curved.	Learner's Book Section 2.1 Workbook Section 2.1 Additional teaching ideas for Section 2.1 **Digital Classroom:** Unit 2 Objects that roll
2.2 2D shapes	4	Identify, describe and sort 2D shapes by their characteristics or properties, including reference to the number of sides and whether the sides are curved or straight.	Learner's Book Section 2.2 Workbook Section 2.2 Resource sheet 2A Resource sheet 2B Resource sheet 2C Worksheet 2A Worksheet 2B Worksheet 2C Language worksheet 2A Language worksheet 2B Additional teaching ideas for Section 2.2
Cross-unit references			
Digital Classroom: Unit 2 multimedia enhancement **Digital Classroom:** Unit 2 activity Learner's Book Check your progress Language worksheet 2A Language worksheet 2B			

Thinking, Working Mathematically questions in Unit 2

Questions	TWM characteristics covered
Learner's Book	
Exercise 2.1 Let's investigate	convincing
Exercise 2.1 question 11	generalising, conjecturing
Exercise 2.1 self-assessment	convincing
Exercises 2.2 Let's investigate	conjecturing
Exercises 2.2 Reflection	conjecturing
Exercise 2.2 question 7	specialising
Exercises 2.2 Let's investigate	conjecturing
Workbook	
Exercise 2.1 question 8	specialising, generalising
Exercise 2.1 question 10	specialising, generalising
Exercise 2.2 question 8	specialising, generalising
Exercise 2.2 question 10	specialising, generalising, conjecturing
Exercise 2.2 question 11	specialising, generalising
Exercise 2.2 question 12	specialising, generalising, conjecturing

BACKGROUND KNOWLEDGE

This unit teaches learners how to identify 3D and 2D shapes. By the end of the unit, learners should understand the differences, similarities and properties of both. To start the unit, learners should be able to see and handle shapes in the environment.

Learners experience shape from an early age. They may have building blocks, shape sorters or jigsaws that introduce shape through play activities. Play activities should sometimes be challenging and lead the learner to new experiences. For example, questions such as 'Tell me what you have made' will help to develop vocabulary and 'I wonder what would happen if …' will help to develop thinking skills.

All shapes, both 2D and 3D, have their own names and properties. It is important to refer to shapes with both. For example, 'This 3-sided triangle is green. This 3-sided triangle is red. Are they the same shape?'

Learners' understanding may be challenged when one shape is positioned ▲ while another is positioned ▼.

Exploring and working with shapes is a way into problem-solving. Ask questions such as 'How do shapes or objects fit together? Which fit together with no spaces between? Which don't? Why do you think this is?'

The activities in this unit will be suitable for learners at different levels of understanding. It is important that plenty of practical work is included as well as discussion and reasoning.

Digital Classroom: Use the multimedia enhancement and associated activity sheet to introduce 2D and 3D shapes. The i button will explain how to use the multimedia enhancement.

Supporting learners with the Getting Started exercise

For learners who find the concept of shape difficult, give them a wide range of 3D and 2D shapes to look at, feel and explore. Reinforce looking at the properties of the shape as well as the name.

- Encourage learners to develop mental images of shapes. For example, 'Close your eyes and think of the clock in our classroom. Does it have straight sides?'

- Encourage learners to look for similarities and differences between shapes. For example, 'This shape has three straight sides and this shape has four straight sides. They both have straight sides. Do you think they are the same shape? Why not?'

TEACHING SKILLS FOCUS

What is active learning?

Active learning or learner-centred learning is an approach to education focusing on the needs of the learners rather than the needs of the teacher or pressure from exams. The focus of lessons is on how the content can or should be taught in order to enable the learner to learn. This can take many different forms.

For example, teachers need to consider different ways that learners can learn. This can be through visual presentations and resources using pictures or diagrams. It can be auditory presentations and activities where learners learn better through spoken rather than written words. Some learners need more time to experience or actively take part in activities by using their hands to touch and handle objects in

order to understand new concepts. Some learners learn best through the written or spoken words of the teacher or workbook. These can be presented by the teacher in different ways according to the needs of the learner and the content of the lesson. Some examples are:

- a class discussion
- a pair activity that asks learners to think about an activity before they do it
- working in a larger group where learners are given a task to work on together, where each member of the group has as active role to play.

A class game is a way to involve the whole class and can be done aurally, visually, kinaesthetically and written. This means that every learner can access it.

2.1 3D shapes

LESSON PLAN

Learning objective	Learning intentions	Success criteria
1Gg.03	• Identify, describe and sort 3D shapes by their properties, including reference to the number of faces, edges and whether faces are flat or curved.	• Learners can name common 3D shapes. • Learners can talk about the similarities and differences between 3D shapes. • Learners can correctly count faces and edges of common 3D shapes. • Learners can use appropriate mathematical vocabulary when talking about 3D shapes.

LANGUAGE SUPPORT

Listen to the ways that learners discuss ideas with each other and ensure they are using the correct mathematical shape vocabulary. Make a class poster showing the different shapes labelled correctly for learners to refer to or make a display of 3D shapes that shows both the names and properties of the shapes. Use questions such as 'What did you find out about spheres and cylinders? Were they good shapes to put at the bottom of a tower? Why not?' Encourage learners to talk and listen to others.

3D: any shape that takes up space

Cube: a box-shaped solid object that has six identical square faces

Curved: a bending line

Cylinder: a solid object with two identical flat ends that are circular and one curved surface

Edge: a place where two faces meet for a 3D solid

Face: the flat surface of a solid object

Flat: not curved or bumpy

Shape: the form of an object, how it is laid out in space

Sphere: a three-dimensional object shaped like a ball. Every point on the surface is the same distance from the centre.

Surface: the outside layer of an object. It has area but no thickness. It is a two-dimensional boundary that can be flat or curved.

Common misconceptions

Misconception	How to elicit	How to overcome
Learners do not understand the vocabulary.	Watch learners' responses when asked to point to or hold up a specific shape.	Focus on the learners that need more practice with 3D shapes. Give them more opportunities to play with and explore the shapes.
Learners describe visual qualities rather than mathematical attributes.	When asking questions to a group or the class, listen to the responses of learners who need more support.	Include the aesthetic as well as the attribute when talking about shapes. For example, 'Look at the red cube.' Ask questions such as 'What else can you tell me about this shape?'

Starter idea

What is a 3D shape? (10 minutes + 10 minutes Getting started exercise)

Resources: Examples of two or more 3D shapes such as a cube and sphere for comparison.

Description:

- Show two contrasting 3D shapes. 'Look at the shapes I am holding. What do you notice about them? We have a block and a ball.' Discuss with the class the similarities (such as if any examples are the same colour). 'Talk to your partner about what you can see. What is the same? What is different?' Encourage descriptions such as 'flat surfaces', 'shapes that roll', 'shapes that slide'.

- Allow time for learners to discuss with their partner then take feedback. Change the two shapes and repeat the activity two or three more times. Then ask the students to complete the Getting started exercise in the Learner's Book. This will allow you to see if there is anything further that needs revisiting before moving on to the rest of the unit.

- Ask more than one learner for an answer. This gives all learners the opportunity to listen to what others say. Give learners an opportunity to explain their answers so that you can deal with any misconceptions early on.

- If a learner has difficulty understanding the difference between 3D shapes, use only two to start with. Choose two that are very different, for example a cube and a sphere. Give learners many opportunities to play with, examine and explore

the two shapes. Set up a ramp so they can see that a sphere rolls and a cube slides. Point out examples of the shapes in and around the classroom.

Main teaching idea

In the bag (40 minutes)

Learning intention: To name and sort common 3D shapes (cube, cylinder, sphere) using features such as number of flat or not flat faces.

Resources: A bag that is not transparent that can hold up to six 3D objects either from around the classroom or from a set of 3D shapes (sphere, cube, cylinder) that the children can feel but not see, a matching set of shapes visible to the class.

Description: This activity allows learners to become aware of some properties of solid shapes when touching them, talking about them or discussing them with a partner. It will consolidate and extend their knowledge and understanding of the properties of 3D shapes and the associated vocabulary.

- Explain the activity to the class. 'In this activity we are going to be exploring 3D shapes. But before we do, we need to find out what a 3D shape is. A 3D shape is any shape that takes up space. Your body is a 3D shape. How do you know? Because you can't take up the same space as anything else and they can't take up any of your space. To check whether something is 3D or not, try to place something in exactly the same place as the shape.'

- Show an example of this by taking two pencils. Lay the first on a table and put the second above it. 'Can I put this pencil (the second one) in exactly the same place as the one on the table? No, I can't. The only way I can do it is to move the first pencil out of the way.'

- 'Here are some 3D shapes for you to look at.' Place the shapes so that the whole class can see them. 'I also have some in my bag.' Choose a learner to come to the front and put their hand in the bag. 'What can you feel? Choose one of the shapes and tell us what you can feel. Feel the top, feel the bottom and feel the sides.'

- Some children may need prompt questions so that they can hear the correct vocabulary, such as 'Do you think your shape matches this one on the table? How do you know?'

- When the learner has described the shape they can feel, ask another learner to come to the front and pick one of the shapes from the table that they

think fits the description. If it matches the shape in the bag, put both shapes next to each other so the class can see. Repeat the activity with different learners until all of the shapes are out of the bag and matched with one on the table.

- Show the class a cube. Point out the different parts of a cube such as edge and face. 'A face is the flat surface on a shape. An edge is where two faces meet.'

- Record the features on the board by drawing a cube and labelling each part. Point to each word, say it out loud and ask the class to repeat them.

- Show the class a sphere. Ask the class what they notice about the sphere. Prompt responses by asking questions such as 'Does it have any flat sides? Does it have any edges?'

- After discussing the cube and the sphere, show the learners a cylinder. 'Talk to your friend about this shape. Find some things that you can tell us about it.' Take feedback from the class and discuss any misconceptions. Draw a cylinder on the board and label each part. Read the labels to the class while pointing at the diagram and ask the class to repeat them.

After this activity, learners could try Learner's Book Exercise 2.1, question 1 and 2 and Workbook Exercise 2.1 questions 1, 2 and 3.

Answers:
- A face is the flat surface on a shape.
- A sphere has no faces but it has a surface.
- A cube has six faces and 12 edges.
- A cylinder has two flat faces.

› Differentiation ideas:

- To support learners who find this difficult, start the activity with just two different 3D shapes until they are confident with what you want them to do. Gradually increase to more shapes.

- To challenge confident learners, use up to ten shapes in the bag and ten shapes on the table. Have variations in size so that not only does the shape have to match but also the size. In this way learners will need to work with two different criteria rather than one.

Plenary idea

Name the shape (10 minutes)

Resources: Shape name cards, one set per learner, and a teacher set of shapes.

Description: Show the class one shape at a time. Ask learners to hold up the matching name card of the shape. Repeat several times, getting gradually faster each time.

⟩ **Assessment ideas:** Use this as an informal assessment activity where you can see the knowledge and understanding of the class regarding 3D shapes. For learners who consistently hold up the wrong card, investigate to see if it is a reading problem or a learning problem. This can be helped for some learners by drawing a 2D representation of the shape on their word card.

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 2.1 Let's investigate

This an ideal activity to cover all of the characteristics of Thinking and Working Mathematically. Learners can make their own decisions and choices, learning from what they have done, in order to improve.

By choosing blocks and building a tower, learners are testing the features of each shape to make the tallest tower possible. As they are working they are monitoring and making decisions about the order of the blocks in the tower that will allow the tallest tower possible to be built.

Throughout the building process, learners are forming ideas about which shape to put where in the pattern of blocks in order to make and maintain a tall, stable structure.

The completed tower is evidence to show the mathematical ideas that were used in order to reach a solution. When talking about their towers, learners will be able to identify and describe the properties of each 3D shape within their tower.

Learners will have learned to build their tower using the properties of each shape, and through discussion with a partner or group, they can compare their ideas and listen to others' ideas. They can then think about what other learners have said and see the advantages or disadvantages of each shape. This will allow them to refine their approach to the task and develop a more effective solution.

CROSS-CURRICULAR LINKS

- Links can be made to shapes in the environment, for example, playground apparatus, buildings, furniture.
- Shapes can be linked to building or constructing patterns or objects in science.

Homework ideas

1   Ask learners to look for shapes around the house to share with the rest of the class. Some families may like to use a camera and take pictures of real-life examples.

2   Ask learners to go on a shape walk outside. They should take paper and pencil with them to record the shapes they find in the environment. Again, they could use a camera to track the route of the walk and the shapes that were found.

2.2 2D shapes

LESSON PLAN

Learning objectives	Learning intentions	Success criteria
1Gg.01	• Identify, describe and sort 2D shapes by their characteristics or properties, including reference to number of sides and whether the sides are curved or straight.	Learners will be able to identify, describe, using correct mathematical vocabulary, and sort 2D shapes by their characteristics or properties, including reference to number of sides and whether the sides are curved or straight.
1Gg.06	• Differentiate between 2D and 3D shapes.	Learners will be able to tell the difference between a 2D and a 3D shape by looking at the characteristics.