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CAMBRIDGE Primary Mathematics

Teacher's Resource 6

Mary Wood, Emma Low,
Greg Byrd & Lynn Byrd

Second edition

Digital Access

Cambridge Assessment International Education
Endorsed for teacher support

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Projects and their accompanying teacher guidance have been written by NRICH. NRICH is an innovative collaboration between the Faculties of Mathematics and Education at the University of Cambridge, part of the University's Millennium Mathematics Project.

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Digital resources

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

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Metacognition

Skills for Life

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

Lesson plan template and examples of completed lesson plans

Curriculum framework correlation

Scheme of work

Diagnostic check and answers

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You can download the following resources for each unit:

Additional teaching ideas

Differentiated worksheets and answers

Language worksheets and answers

Resource sheets

End-of-unit tests and answers

Acknowledgements

Introduction

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

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

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

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

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

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

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

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

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

We hope you enjoy using this course.

Eddie Rippeth

Head of Primary and Lower Secondary Publishing, Cambridge University Press

About the authors

Mary Wood

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

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

Emma Low

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

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

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

Lynn Byrd

Lynn gained an honours degree in mathematics at Southampton University in 1987 and then moved onto Swansea University to do her teacher training in Maths and P.E. in 1988.

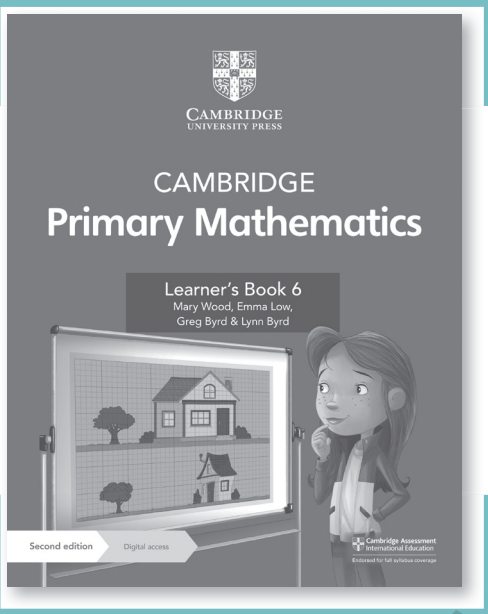
She taught mathematics for all ability levels in two secondary schools in West Wales for 11 years, teaching across the range of age groups up to GCSE and Further Mathematics A Level. During this time, she began work as an examiner. In 1999, she finished teaching and became a senior examiner, focusing on examining work and writing. She has written or co-authored a number of textbooks, homework books, workbooks and teacher resources for secondary mathematics qualifications.

Greg Byrd

After university and a year of travel and work, Greg started teaching in Pembrokeshire, Wales, in 1988. Teaching mathematics to all levels of ability, he was instrumental in helping his department to improve GCSE results. His innovative approaches led him to become chairman of the 'Pembrokeshire Project 2000', an initiative to change the starting point of every mathematics lesson for every pupil in the county. By this time he had already started writing. To date he has authored or co-authored over 60 text books, having his books sold in schools and colleges worldwide.

How to use this series

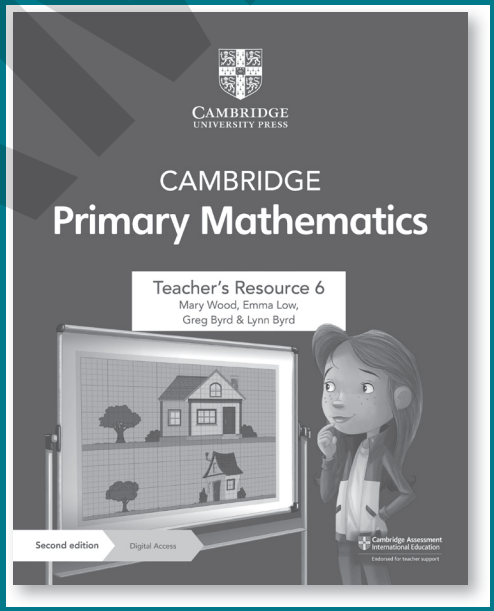
All of the components in the series are designed to work together.

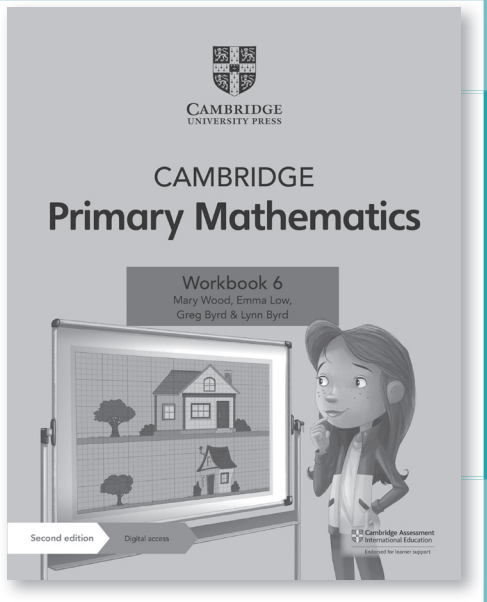


The Learner's Book is designed for learners to use in class with guidance from the teacher. It offers complete coverage of the curriculum framework. A variety of investigations, activities, questions and images motivate learners and help them to develop the necessary mathematical skills. Each unit contains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

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

- a print book with detailed teaching notes for each topic
- Digital Access with all the material from the book in digital form plus editable planning documents, extra guidance, downloadable worksheets and more.

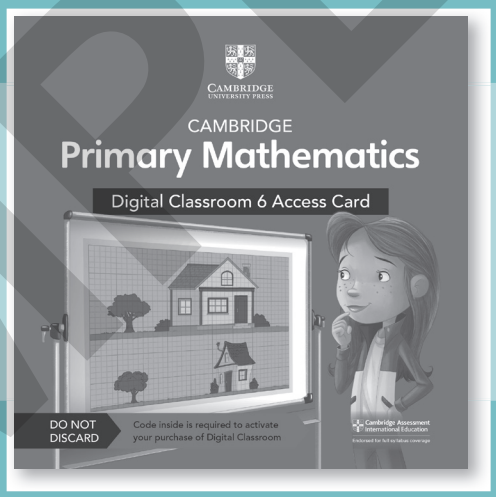


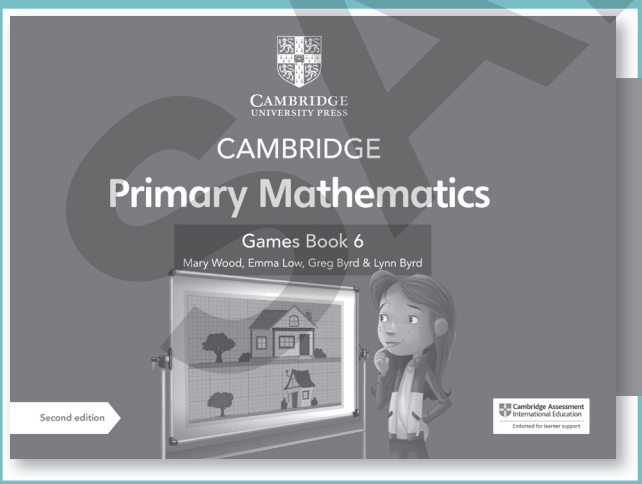


The skills-focused write-in Workbook provides further practice of all the topics in the Learner's Book and is ideal for use in class or as homework. A three-tier, scaffolded approach to skills development promotes visible progress and enables independent learning, ensuring that every learner is supported.

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

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





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

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

How to use this Teacher's Resource

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

Teaching notes

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

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

Topic	Approximate number of learning hours	Outline of learning content	Resources
1.1 Place value	3	Explain the value of a digit in a decimal (tenths, hundredths and thousandths).	Learner's Book Section 1.1 Workbook Section 1.1 Additional teaching ideas for Section 1.1 Resource sheet 1A
Cross-unit resources			
Diagnostic check and answers **Digital Classroom:** Unit 1 multimedia enhancement **Digital Classroom:** Unit 1 activity Worksheet 1A Worksheet 1B			

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

Learners' prior knowledge can be informally assessed through the **Getting started** feature in the Learner's Book.

BACKGROUND KNOWLEDGE

In earlier stages, learners used place value charts to help them understand place value. In Stage 5, they worked with whole and decimal numbers (up to two decimal places), reading and writing them correctly.

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

TEACHING SKILLS FOCUS

Questioning

The use of questions is crucial in helping learners understand mathematical ideas and use mathematical terms correctly.

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

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

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

LEARNING PLAN

Framework codes	Learning objectives	Success criteria
6Np.01	• Understand and explain the value of each digit in decimals (tenths, hundredths and thousandths).	• Learners explain the value of each digit in numbers with up to 3 decimal places.

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

LANGUAGE SUPPORT

Compose: put together. For example, 600 + 30 + 2 + 0.02 is 632.02.

Decimal: a number written in decimal notation, for example, 34.518.

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

Misconception	How to identify	How to overcome
Learners may consider thousandths to be greater than hundredths and hundredths to be greater than tenths.	Through discussion and in written work.	Ensure that place value charts are used as visual prompts.

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

Starter idea

Checking understanding (10 minutes)

Resources: Getting started exercise at the start of Unit 1 of the Learner's Book.

Description: Give learners 5 minutes to look at the questions. Then on the board write the statement '___ is a multiple of 3.'

Main teaching idea

Using an inverse operation (5 minutes)

Learning intention: To emphasise the fact that addition and subtraction are inverse operations. To encourage reflection on methods.

Resources: Learner's Book Exercise 1.1, Question **4**

The **Cross-curricular links** feature provides suggestions for linking to other subject areas.

CROSS-CURRICULAR LINKS

Different number systems

In this unit learners discover more about our number system, the decimal system, which uses ten digits: 0–9.

Thinking and Working Mathematically skills are woven throughout the questions in the Learner's Book and Workbook. These questions, which are indicated by ✦, incorporate specific characteristics that encourage mathematical thinking. The teaching notes for each unit identify all of these questions and their characteristics. The **Guidance on selected Thinking and Working Mathematically questions** section then looks at one of the questions in detail and provides more guidance about developing the skill that it supports

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.1, question 8

In this question, learners must choose and test an example to see if it has a designated answer. When they do this successfully, they are **specialising**.

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

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

PROJECT GUIDANCE: PROJECT 1 ODD SEQUENCE

Why do this project?

This task gives learners the chance to apply what they know about square numbers and odd numbers to a non-linear sequence. In addition, they are encouraged to **generalise** the pattern and to convince others why it occurs.

Possible approach

Begin by writing '1, 4, 9…' on the board, relatively slowly, while the class watches. Ask learners to talk in pairs about what they notice and what they wonder.

Digital resources to download

This Teacher's Resource includes a range of digital materials that you can download from Cambridge GO.

Helpful documents for planning include:

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

Each unit includes:

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

Additionally, the Teacher's Resource includes:

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

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, the curriculum framework is divided into three major strands:

- Number
- Geometry and Measure
- Statistics and Probability

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

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

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

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.uk**

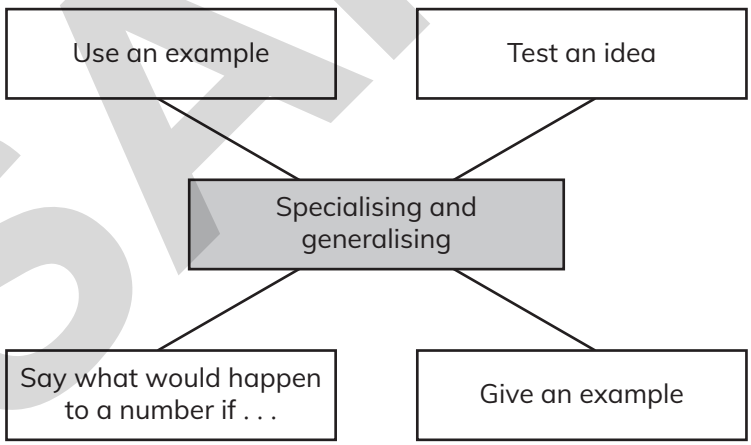
Introduction to Thinking and Working Mathematically

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

There are many opportunities for learners to develop these skills throughout Stage 6. 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, as well as sentence starters to help learners formulate their thoughts. Within the teaching notes for each unit, we have also selected one question from each exercise and provided further guidance on Thinking and Working Mathematically within the context of these questions to help guide and familiarise you with all of the characteristics.

Specialising and generalising

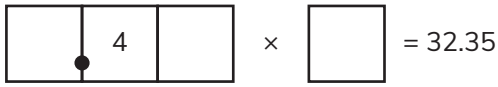


Specialising

Specialising involves choosing and testing 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:

Use the digits 5, 6 and 7 to make this calculation correct.



Answer: 6.47 × 5

Learners will show they are **specialising** when they choose numbers and check to see whether the resulting calculation gives an answer of 32.35. Learners could work systematically through all the possibilities but they should realise that making an estimate may give them a suitable starting point.

SENTENCE STARTERS

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

Generalising

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

Example:

Ollie writes a number sequence starting at 15 and counting back in steps of 0.4.

15, 14.6, 14.2, 13.8 …..

He says, '1.5 cannot be in my sequence.'

How do you know Ollie is correct without counting back?

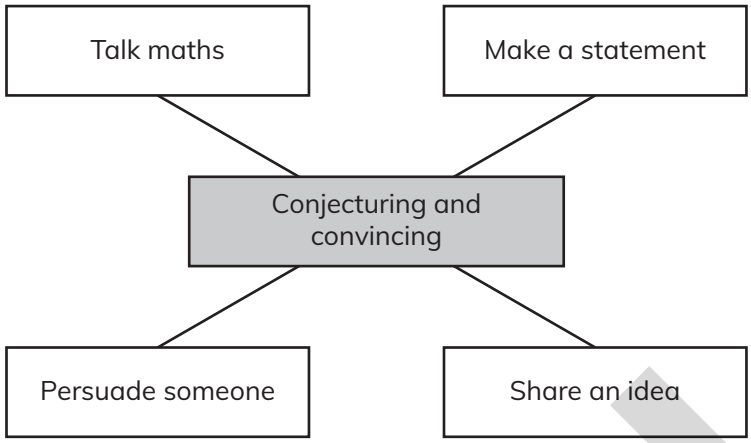
Answer: All the tenths digits are even and 5 is odd

Learners may notice that the tenths digit is always even and that they repeat 0, 6, 2, 8. 4. It follows that 1.5 cannot be in the sequence as the tenths digit is odd. Learners will show they are **generalising** when they notice a property of the sequence and use it to help them answer the question.

SENTENCE STARTERS

- I found the pattern … so …

Conjecturing and convincing

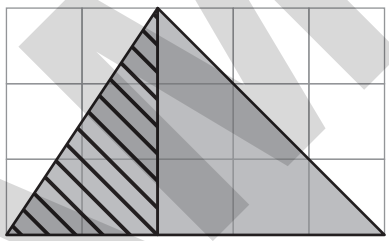


Conjecturing

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:

Stefan knows that he can find the area of a right-angled triangle by finding half the area of the rectangle it fits in. He predicts that he can find the area of the shaded triangle by adding the areas of the two right-angled triangles. He counts squares to try out his prediction.



$\frac{1}{2} \times 2 \times 3 = 3$ and $\frac{1}{2} \times 3 \times 3 = 4\frac{1}{2}$ squares.

Total $7\frac{1}{2}$ squares.

Learners show they are **conjecturing** when they offer ideas of how they could find the area of the triangle.

SENTENCE STARTERS

- I think that …
- I wonder if …

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:

Amy swims $\frac{1}{2}$ of 500 metres and Bella swims $\frac{3}{10}$ of 800 metres.

Who swims further? Explain how you know.

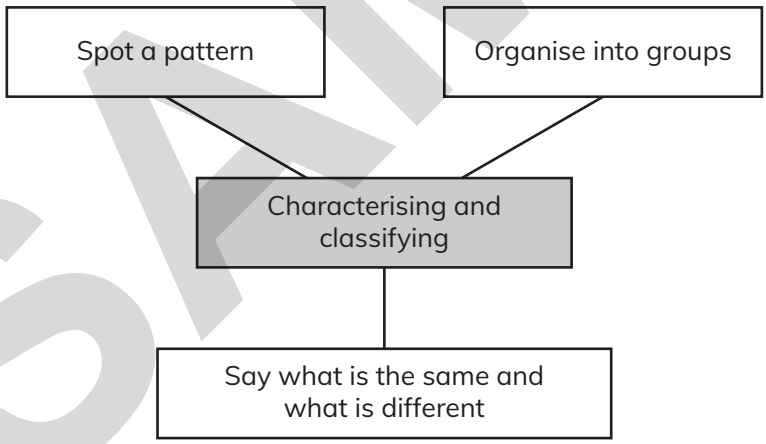
Answer:
Bella swims further than Amy
$\frac{1}{2}$ of $500 = 250$ m and $\frac{3}{10}$ of $800 = 240$ m

Learners are **convincing** when they demonstrate that Bella swims further than Amy by showing the calculations. (Evidence may be in the form of written text or by using examples.)

SENTENCE STARTERS

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

Characterising and classifying

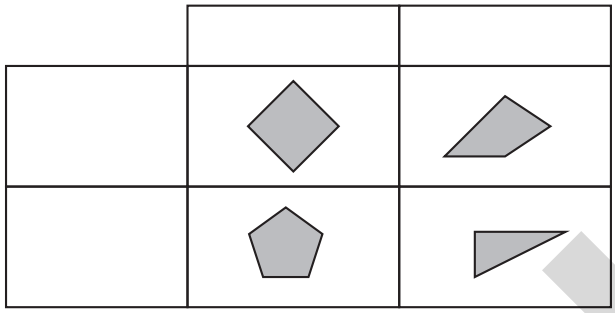


Characterising

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

Example:

Write labels for the Carroll diagram.



Answer: Rregular / not regular and quadrilateral / not a quadrilateral

Learners will show they are **classifying** when they correctly identify properties of the polygons so they can label the diagram.

SENTENCE STARTERS

- This is similar to … so ….
- The properties of … include ….

Classifying

Classifying involves organising mathematical objects into groups according to their properties. Learners organise objects or numbers into groups according their mathematical properties. They use Venn and Carroll diagrams.

Example:

Write the letter of each expression in the correct cell.

A $\frac{2}{8} \times 4$ **B** $3 \times \frac{2}{3}$ **C** $\frac{3}{4} \times 4$ **D** $\frac{2}{8}$ of 4

E $\frac{2}{3} \times 3$ **F** $\frac{2}{8} + \frac{2}{8} + \frac{2}{8} + \frac{2}{8}$ **G** $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4}$ **H** $\frac{2}{3}$ of 3

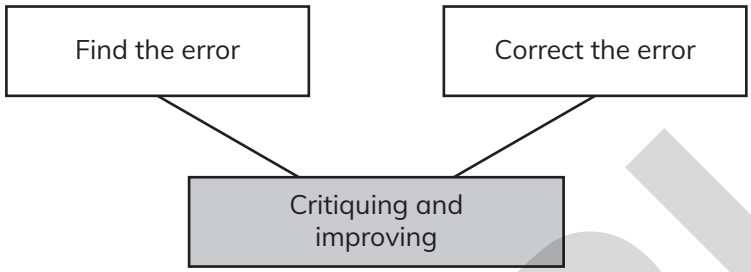
Answer 1	Answer 2	Answer 3

Learners will show they are **classifying** when they calculate each answer so they can correctly place the calculation in the correct cell in the table.

SENTENCE STARTERS

- … go together because …
- I can organise the … into groups according to …

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:

Lisa and Marie calculate 13.6 × 7. Here are their methods.

Lisa's method

13.6 × 7

136 ÷ 10 × 7

= 136 × 7 ÷ 10
= 952 ÷ 10
= 95.2

Marie's method

```
   13.6
×     7
  95.2
  24
```

What are the advantages and disadvantages of the two methods?

Learners will show they are **critiquing** when they compare the methods.

SENTENCE STARTERS

- The advantages of ... are ... and the disadvantages are ...

Improving

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

Example:

Correct all the statements that are false.

3.04 is 3 when rounded to the nearest whole number and the nearest tenth.

5.03 is 5 when rounded to the nearest whole number and 5.0 when rounded to the nearest tenth.

6.95 is 7 when rounded to the nearest whole number and 6.9 when rounded to the nearest tenth.

Learners must work through each example in turn to decide whether it is correct or not. In this example they are asked only to correct those that are not correct. As they do this they are **improving**.

SENTENCE STARTERS

- This method would be better if …
- I can improve this method by …

A Thinking and working mathematically resource sheet for learners is available to download from Cambridge GO (as part of this Teacher's Resource).

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 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 feature 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.

Developing mental strategies

Learners begin to use mental methods in the early stages of learning mathematics, usually starting with counting objects and progressing to using number lines or squares to help them work out answers. Later they are taught to remember and recall number facts and develop the language necessary to talk about mathematics. As they progress, they learn more sophisticated mental methods. They may develop some methods intuitively, but some you will need to teach. It is important that you provide regular opportunities for learners to explain and discuss their methods so they share ideas with one another and acquire a range of mental strategies.

At some stage, it can be hard for learners to hold intermediate steps of a calculation in their head. At this point, encourage them to make notes or jottings. Not all learners will do a mental calculation in the same way, but some methods are more efficient and reliable than others. If you allow time for learners to discuss, explain and compare different methods you can guide them towards choosing and using efficient methods. Learners will see the need for methods that can be applied generally and this eventually leads towards using standard written methods.

You should start all mathematics lessons with a counting activity, tables or other mental activity. The session can be used to:

- practise and consolidate the rapid and accurate recall of number facts
- revise mental strategies for tackling number problems
- explain and demonstrate new mental strategies
- discuss different ways of solving problems
- reinforce the correct use of mathematical vocabulary.

Calculators can be used as a teaching aid to promote mental calculation and explore mathematical patterns. Learners will, with guidance from you, start to understand when it is appropriate to use a calculator.

This section provides details of activities and games to play with the whole class. They can be used within lessons to develop strategies for mental calculations involving addition, subtraction, multiplication and division as well as other curriculum content. Expect to spend about 10 minutes on each activity. Most of them can be used effectively as starters, main activities or plenaries.

LANGUAGE SUPPORT

There is a lot of vocabulary associated with the four basic mathematical operations. You may want to display these words in the classroom to help learners become familiar with them. You should ensure learners are using the correct vocabulary in discussions and encourage them to use a variety of terms, perhaps by asking questions such as, 'How else could you say that?'

Addition		Subtraction	
add	total	subtract	difference
more	altogether	take away	count back
plus	count on	minus	decrease
sum	increase	leave	
Multiplication		**Division**	
lots of	multiply	share	halve
groups of	product	group	
times	double	divide	

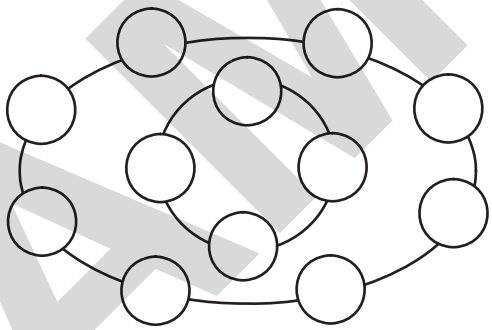
Teaching ideas

1 Number puzzles (XX minutes)

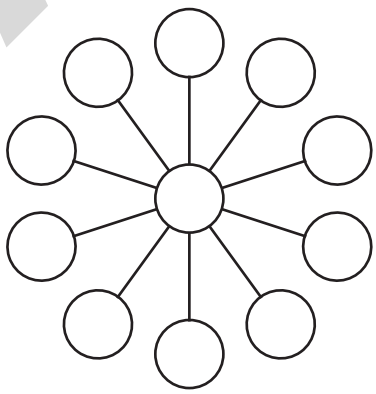
Resources: None.

Description: Write the puzzle on the board, give learners time to find a solution then discuss answers and ways of tackling the problem.

1 Can you write the numbers 1–12 in the circles so the total of the numbers in the outside ring is the same as the total in the inside ring. Use each number once?



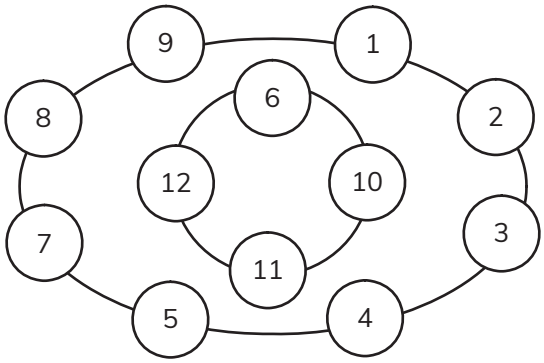
2 Can you put the numbers 1 to 11 in the circles so that every line has the same total?

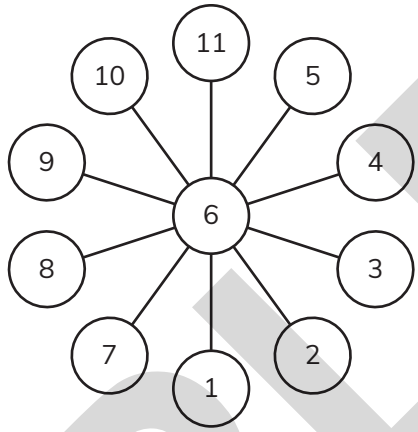


Questions to pose:

- How did you decide which number (s) to place first?
- Can you find a different solution?

Answers:





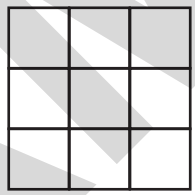
This activity is good for reminding learners of problem solving strategies.

2 Table practice – a game for 2 players (XX minutes)

Resources: A dice or spinner.

Description: These instructions are given for the seven times table; you can adapt them for other tables.

Each player draws a 3 by 3 grid.



Player 1 rolls the dice, multiplies the score by 7 and records the answer in their grid. Player 2 then does the same thing. Continue until both players' grids are full.

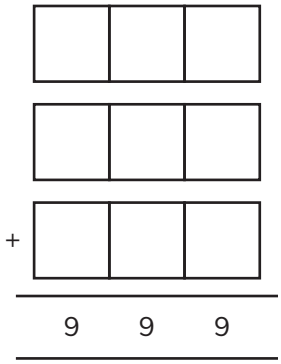
Players take turns to roll the dice again. Multiply the dice score by 7. If the answer is on either player's grid then they cross out that number. If the number appears more than once, only cross out one number.

The winner is the first player to have all their numbers crossed out.

3 Make 999 (XX minutes)

Resources: None.

Description: Use each of the digits 1–9 once to make this calculation correct.



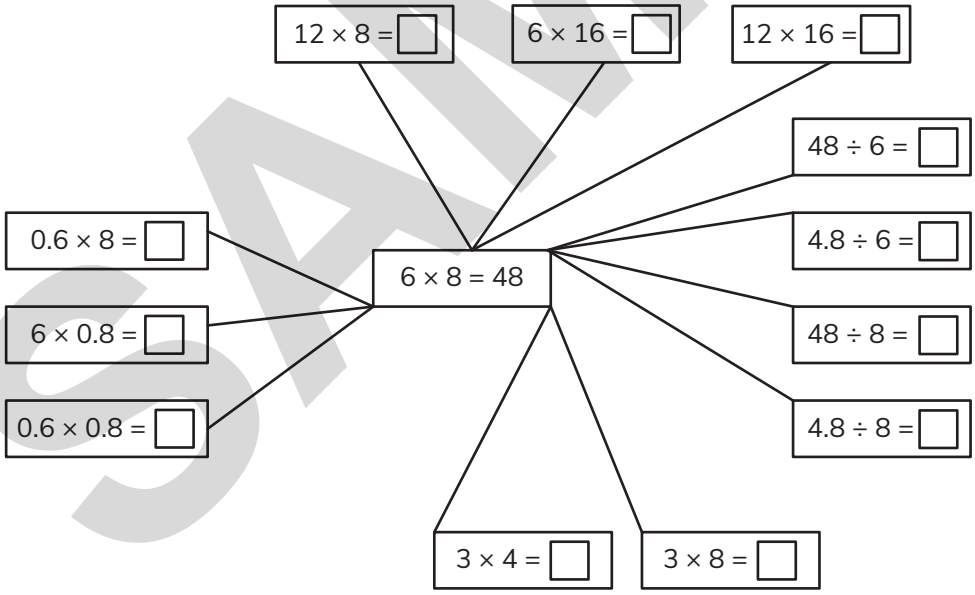
Answer: 1, 3 and 4 in the hundreds, 2, 7 and 9 in the tens and 5, 6 and 8 in the ones, for example: 496 + 175 + 328

4 Linked calculations (XX minutes)

Resources: Display diagram.

Description: Start with a known fact, for example, 6 × 8 = 48, and ask learners to use this fact to work out the other facts on the diagram.

Allow a few minutes for learners to find solutions then take feedback making sure you ask learners to explain their methods



5 Multiplication and division using factors (XX minutes)

Resources: None.

Description: Ask learners to jot down the answers to these calculations:

$3 \times 6 = \square$ $30 \times 6 = \square$ $300 \times 6 = \square$ $3 \times 60 = \square$ $3 \times 600 = \square$

Ask, 'How did you work out your answers?'

Say that 3 and 10 are **factors** of 30, so we have used factors to help us multiply.

30 × 6 split 30 into 10 × 3

10 × 3 × 6

10 × 18

= 180

Ask learners to use factors to help them multiply 35×8 and divide 96 by 6. Take feedback and summarise strategies:

Using factors

- Split one number into a factor pair to make multiplication easier, for example:

35 × 8 split 35 into 7 × 5

7 × 5 × 8

7 × 40

= 280

- Split one number into a factor pair to make division easier, for example:

96 ÷ 6 split 6 into 2 × 3

96 ÷ 2 ÷ 3 96 ÷ 2 = 48 then 48 ÷ 3

= 16

Remind learners that this method is based on the **Associative Law** (see Unit 16).

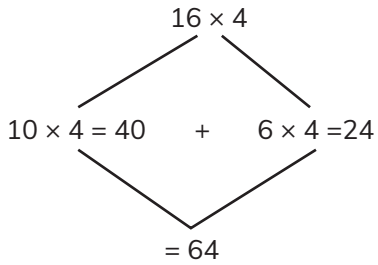
6 Multiplication and division using decomposition (XX minutes)

Resources: None.

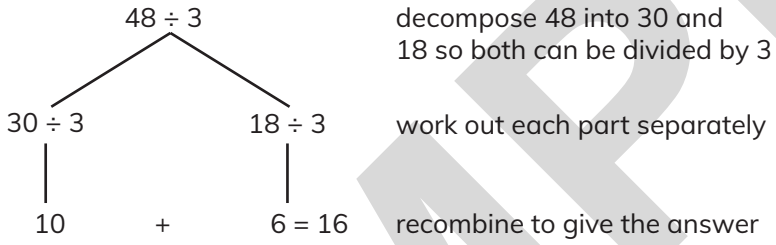
Description: Ask learners to look at these calculations and then explain the methods to their partner. Take feedback and summarise strategies:

Using decomposition

- Decompose a number to make a simpler multiplication, for example:



- Decompose a number to make a simpler division, for example:



Ask learners to do these calculations:

96 × 7 132 ÷ 6

Answers: 672, 22

Remind learners that this method is based on the **Distributive Law** (see Unit 16).

7 Think of a number (XX minutes)

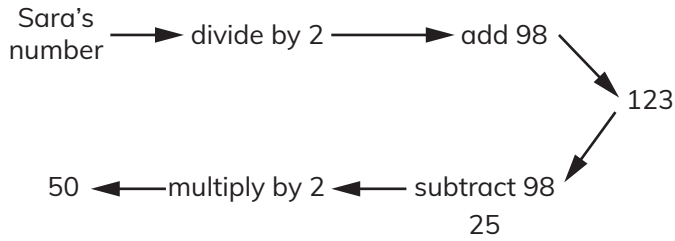
Resources: None.

Description: Present 'Think of a number' questions involving multiplication and division, for example:

Sara thinks of a number. She divides her number by 2 and adds 98 to the result. Her answer is 123. What is Sara's number?

Answer: 50

A method of recording:



› **Assessment ideas:** This activity enables you to assess learners understanding of multiplication and division as **inverse operations.**

8 Decimal magic squares (XX minutes)

Resources: None.

Description: Complete these squares so the sum of each row vertically, horizontally and diagonally is the same.

3.5	1	4.5
		2
1.5	5	

2.25		
	3	2.5
	2	3.75

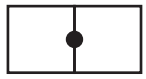
Answer:

3.5	1	4.5
4	**3**	2
1.5	5	**2.5**

2.25	**4**	**2.75**
3.5	3	2.5
3.25	2	3.75

9 Game: compare and order decimals (XX minutes)

Resources: A 0–9 dice or spinner or a set of digit cards. Players draw a grid:



Description: Ask players to make a number between 1.5 and 8.5; 2.3 and 6; 0.3 and 5 and so on. Discuss how answers can be written as a number sentence, for example, 3.8 is between 1.5 and 8.5 and can be written as $1.5 < 3.8 < 8.5$

10 Make 1 (XX minutes)

Resources: None.

Description: Find pairs of fractions and decimals that total 1.

$\frac{4}{5}$ 0.4 $\frac{1}{10}$ $\frac{2}{5}$ 0.25 0.2 $\frac{3}{5}$ 0.9 $\frac{3}{4}$ 0.6

Make up a similar puzzle for your partner to try.

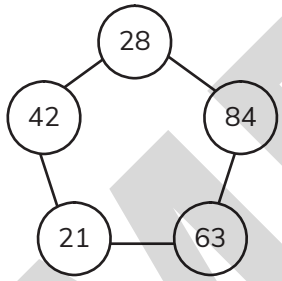
Answers: $0.2+\frac{4}{5}$, $0.25+\frac{3}{4}$, $0.4+\frac{3}{5}$, $0.6+\frac{2}{5}$, $0.9+\frac{1}{10}$

11 Equivalent fractions (XX minutes)

Resources: None.

Description: Use two adjoining numbers, one as the numerator and the other the denominator to make fractions equivalent to:

$\frac{1}{3}$ $\frac{1}{2}$ $\frac{3}{4}$



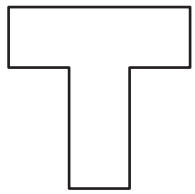
Example: Find a fraction equivalent to $\frac{2}{3}$. Use 28 and 42 because $\frac{28}{42}=\frac{2}{3}$

Answers: $\frac{21}{63}$, $\frac{21}{42}$, $\frac{63}{84}$

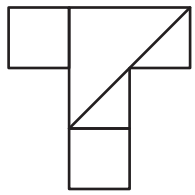
12 Squares and triangles (XX minutes)

Resources: None.

Description: Draw three straight lines to divide this T shape into three triangles and two squares.



Answer:



Plenary ideas

1 The answer is … What is the question? (5–10 minutes)

Resources: None.

Description: Write a number on the board, for example, 144, and ask learners to write down three questions that would give an answer of 144. Collect ideas and discuss the methods used to give the answer.

› **Assessment ideas:** Listening to learners' responses will give you information about how well learners chose an appropriate strategy.

2 True or false? (10 minutes)

Resources: None.

Description: As learners are working on mental calculation activities, look out for errors that they make. Use these as a basis for writing number sentences on the board and also include some statements that are correct. Learners must decide whether each statement is true or false and explain their decision.

Example: $2.5 + 3.9 = 5.14$ is false because:

- The answer should have 1 decimal place, not 2.
- An estimate (by rounding each decimal number to the nearest whole number) would give $3 + 4 = 7$ which is much bigger than 5.14.

› **Assessment ideas:** Listening to learners' responses will give you information about how well they are making connections, for example, to work on estimation.

3 What else do you know? (10–15 minutes)

Resources: None.

Description: Write a multiplication fact such as $1.25 \times 10 = 12.5$ on the board. Ask learners to construct a diagram to show other facts that can be found. Start them off by giving a set of related facts for example:

$$\boxed{1.25 \times 10 = 12.5} \longrightarrow \boxed{1.25 \times 5 = 6.25} \longrightarrow \boxed{12.5 \times 5 = 62.5}$$

Explain that they can continue this 'branch' or start a new 'branch'.

Allow five minutes for learners to work on their diagrams, then work as a class to build a diagram using as many different mental methods as possible.

› **Assessment ideas:** Watching learners as they work and listening to their suggestions will give you information about their progress.

1 The number system

Unit plan

Topic	Approximate number of learning hours	Outline of learning content	Resources
1.1 Place value	3	Explain the value of a digit in a decimal (tenths, hundredths and thousandths). Multiply and divide whole numbers and decimals by 10, 100 and 1000. Compose, decompose and regroup numbers, including decimals (tenths, hundredths and thousandths).	Learner's Book Section 1.1 Workbook Section 1.1 Additional teaching ideas for Section 1.1 Resource sheet 1A Resource sheet 1B Resource sheet 1C Resource sheet 1D Resource sheet 1E
1.2 Rounding decimal numbers	3	Round numbers with two decimal places to the nearest tenth or whole number.	Learner's Book Section 1.2 Workbook Section 1.2 Additional teaching ideas for Section 1.2 Resource sheet 1F
Cross-unit resources			
Diagnostic check and answers **Digital Classroom:** Unit 1 multimedia enhancement **Digital Classroom:** Unit 1 activity Worksheet 1A Worksheet 1B Language worksheet 1A Language worksheet 1B Learner's Book Check your progress Unit 1 test and answers			

Thinking and Working Mathematically questions in Unit 1

Questions	TWM characteristics covered
Learner's Book	
Exercise 1.1 question 3	Specialising
Exercise 1.1 question 8	Specialising
Exercise 1.2 question 6	Improving
Exercise 1.2 question 9	Convincing
Workbook	
Exercise 1.1 question 12	Convincing
Exercise 1.1 question 14	Specialising
Exercise 1.1 question 15	Convincing
Exercise 1.2 question 7	Specialising
Exercise 1.2 question 11	Convincing

BACKGROUND KNOWLEDGE

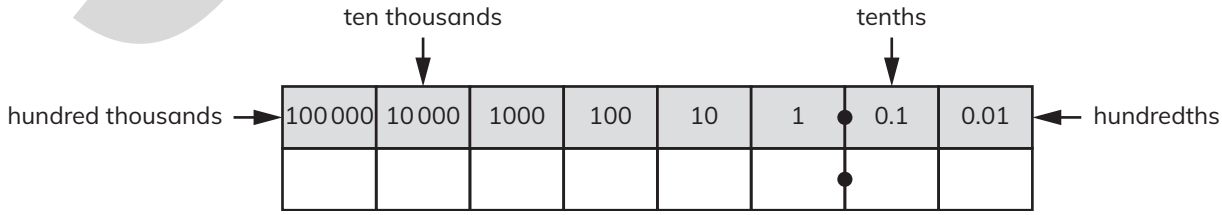
In earlier stages, learners used place value charts to help them understand place value. In Stage 5, they worked with whole and decimal numbers (up to two decimal places), reading and writing them correctly. Learners explained how the value of each digit was determined by its position in a number. They learned how to decompose and regroup numbers as a basis for adding and subtracting numbers in columns. They used their knowledge of place value to multiply and divide whole numbers by 10 and 100 and 1000 and decimal numbers by 10 and 100. They rounded whole numbers to the nearest 10, 100, 1000, 10 000 and 100 000, and decimal numbers with one decimal place to the nearest whole number.

In this unit, they will build on this knowledge as we increase the range of numbers to include decimals with up to three decimal places.

Digital Classroom: Use the multimedia enhancement to demonstrate examples of patterns and sequences in everyday life. The I button will explain how to use the multimedia enhancement.

Supporting learners with the Getting started exercise

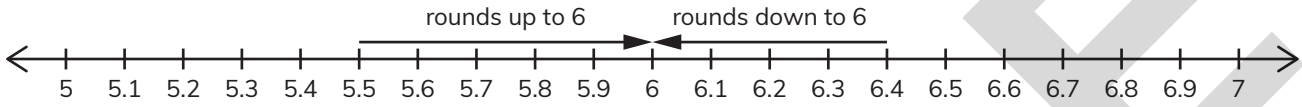
You can check learners' prior knowledge and understanding by using the Getting started exercise in the Learner's Book. One of the main ideas in place value is that the value of a digit depends on its position in the number. Questions 1 and 2 assess the learner's understanding of place value and how numbers can be composed and decomposed as well as their ability to read, write and say numbers correctly. Support learners who are having difficulty by providing place value grids:



CONTINUED

To answer questions 3 and 4, learners need to understand that multiplying a digit by 10 can be represented by moving the digits one place to the left and multiplying a digit by 100 involves moving the digits two places to the left. In a similar way, division can be represented as movements to the right. Learners can show this using arrows on a place value grid.

Questions 5 and 6 assess learners' ability to round numbers with 1 decimal place to the nearest whole number. Use a number line to support learners who are struggling, for example:



TEACHING SKILLS FOCUS

Questioning

The use of questions is crucial in helping learners understand mathematical ideas and use mathematical terms correctly. It is easy to use questions which learners answer by recalling and applying facts (rows 1 and 2 in the table), but more difficult to use a full range of questions which require learners to give more complex answers in which they explain their thinking (rows 3–6) in the table).

Type of question	Example
Recalling facts	How many millimetres are in a metre?
Applying facts	What are the factors of 24?
Predicting	What do you think will happen?
Designing procedures	How can you multiply 435 by 25?
Interpreting results	The graph shows _____. Can you explain it?
Applying reasoning	Why is the product of two even numbers always even?

CONTINUED

You can use questions during a lesson to get learners started on a task, to extend their thinking or to help them when they are stuck. Try using some of these ideas.

Type of question	Examples
Getting started	• What do you know already that might help? • What information do you have? What do you need to know? • Will you do it mentally, with paper and pencil or will you use a calculator? Why? • What equipment do you need? • What method are you going to use? Why? • How will you record your results?
During an activity	• Can you explain what you have done so far? • Why did you decide to use this method? Can you think of a different method that might work better? • Is there a quicker/better method of doing this? • Have you thought of all the possibilities? How can you be sure?
When learners are stuck	• What have you done so far? • Is there something you already know that might help? • Have you talked to your partner? • Could you try it with simpler numbers / using a number line / _____? • What about _____ ?

As you work through this unit, focus on your questioning techniques. Think about the questions you will ask during each lesson. You might find it helpful to prepare a few key questions.

Reflection:

- At the end of the unit, think about what went well and what did not go as planned.
- Try waiting for **at least three** seconds after asking a question to get better responses from your learners.

Mental mathematics guidance

Recalling number facts is important and regular short periods of practice will help learners to remember them. Mental calculation is more than just recalling facts, as it includes applying facts, designing and comparing procedures and interpreting results. Combining known multiplication and division facts with an understanding of place value enables learners to work out related facts involving decimals; for example, if you know that $6 \times 7 = 42$ you can work out $0.6 \times 7 = 4.2$ and $6 \times 0.7 = 4.2$

Try spending a few minutes at the beginning of a lesson applying known facts:

- Give learners a known fact such as $8 \times 7 = 56$ and ask them to find and explain any two associated facts.
  For example, $0.8 \times 7 = 5.6$ (divide by 10) and $0.8 \times 0.7 = 0.56$ (divide by 10 and 10 again).
- Give learners a calculation such as $4.8 \div 6$ and ask them how they can use a known fact to work out the answer.
  For example, $48 \div 6 = 8$ so $4.8 \div 6 = 0.8$ (divide by 10).

Learners will work on decomposing numbers in this unit, for example, $2.9 = 2 + 0.9$. It is appropriate to spend some time showing how compensation, for example, $2.9 = 3 - 0.1$, can support mental calculation. An example is when you add or subtract a decimal with ones and tenths that is nearly a whole number:

- $4.3 + 2.9$ can be done mentally by adding 3 and subtracting 0.1:
  $4.3 + 3 - 0.1 = 7.3 - 0.1 = 7.2$
- $6.5 - 3.8$ can be done mentally by subtracting 4 and adding 0.2:
  $6.5 - 4 + 0.2 = 2.5 + 0.2 = 2.7$

1.1 Place value

LEARNING PLAN

Framework codes	Learning objectives	Success criteria
6Np.01	• Understand and explain the value of each digit in decimals (tenths, hundredths and thousandths).	• Learners explain the value of each digit in numbers with up to 3 decimal places.
6Np.02	• Use knowledge of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000.	• Learners multiply and divide whole numbers and decimals by 10, 100 and 1000.
6Np.03	• Compose, decompose and regroup numbers including decimals (tenths, hundredths and thousandths).	• Learners compose, decompose and regroup numbers with up to 3 decimal places.

LANGUAGE SUPPORT

Compose: put together. For example, 600 + 30 + 2 + 0.02 is 632.02.

Decimal: a number written in decimal notation, for example, 34.518.

Decimal place: the position of a digit to the right of the decimal point in a decimal number. The number 45.674 has three decimal places.

Decimal point: the decimal point separates whole numbers from decimal places.

10	1	•	0.1	0.01	0.001
5	7	•	0	8	2

You read 57.082 as 'fifty-seven point zero eight two'.

Decompose: break down a number into parts. For example, 56.123 is 50 + 6 + 0.1 + 0.02 + 0.003.

Hundredth: one part in one hundred equal parts. As a decimal it is written as 0.01.

Place value: the value of a digit determined by its position. For example, in 830.467 the 7 has a value of 7 thousandths (0.007).

100	10	1	•	0.1	0.01	0.001
8	3	0	•	4	6	7

Regroup: change the way a number is written. For example, 56.4 = 50 + 6 + 0.4, but you can change this to 50 + 5 + 1.4.

Tenth: one part in ten equal parts. As a decimal it is written as 0.1.

Thousandth: one part in one thousand equal parts. As a decimal it is written as 0.001.

Give learners opportunities to practise reading decimals correctly, for example, it is important to read 15.37 as 'fifteen point three, seven' and not as 'fifteen point thirty-seven'. You should also ensure that learners differentiate clearly between hundreds and hundredths and between thousands and thousandths.

CONTINUED

Sometimes there are differences in the vocabulary used internationally. Some key words have alternative versions, for example:

Used in this book	Alternative
ones	units
decompose	partition or write in expanded form
regroup	recombine

A decimal separator is a symbol used to separate the whole number part from the fractional part of a number. Different countries use different symbols. Many countries use a decimal point (dot), but others use a comma.

Common misconceptions

Misconception	How to identify	How to overcome
Learners may consider thousandths to be greater than hundredths and hundredths to be greater than tenths.	Through discussion and in written work.	Ensure that place value charts are used as visual prompts.
Learners write the value of a digit incorrectly as the unit without the quantity, for example, the value of the 5 in 6.975 is '5 thousandths', not 'thousandths'.	Through discussion and in written work.	Prompt for the correct answer when demonstrating with place value grids.

Starter idea

Getting started (20 minutes)

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

Description: Give learners time to answer the Getting started questions in their exercise books. After 10 minutes, ask learners to swap their books with a partner and check their partner's answers as you discuss the questions as a class. After the class have marked their work, walk round and check if there are any questions that learners struggled with. You may want to recap particular concepts as a class. Refer to the Background knowledge section at the start of this unit for suggestions for how to address gaps in learners' prior knowledge.

Main teaching ideas

Place value (20–30 minutes)

Learning intention: Understand and explain the value of each digit in decimal numbers (tenths, hundredths and thousandths).

Resources: A display copy of Resource sheet 1B, a 0–9 dice or spinner (one for each pair).

Description: Display a place value chart and write down the number 2002.2. Mark it on the chart and read it aloud as 'two thousand and two point two'.

Ask questions about each digit in turn:

- What is the value of this digit?
- How many times larger is the value of this 2 than this 2?

You may find it useful to demonstrate the relationship between digits using arrows, for example:

1000	100	10	1	0.1	0.01
2	0	0	2	2	

x 10

2 ones are 10 times bigger than 2 tenths.

Repeat with other numbers up to two decimal places, for example, 3003.33.

Watch out for learners who do not read decimal numbers correctly: we read the number 1.23 as 'one point two, three' and not as 'one point twenty-three' because the digits 2 and 3 represent two tenths and 3 hundredths not 2 tens and 3 ones. Similarly, we read 1.02 as 'one point zero, two'.

Explain that we can extend the range of numbers that we used in Stage 5 to include thousandths.

Practise writing and saying numbers shown on a place value chart. For example, 'What is the shaded number?'

1000•	2000•	3000•	4000•	5000•	6000•	7000•	8000•	9000•
100•	200•	300•	400•	500•	600•	700•	800•	900•
10•	20•	30•	40•	50•	60•	70•	80•	90•
1•	2•	3•	4•	5•	6•	7•	8•	9•
0•1	•2	•3	•4	•5	•6	•7	•8	•9
0•01	•02	•03	•04	•05	•06	•07	•08	•09
0•001	•002	•003	•004	•005	•006	•007	•008	•009

Answer: 9204.705 nine thousand two hundred and four point seven, zero, five

Display other numbers, for example, 1234.005, and ask questions such as:

- How do you say this number?

Answer: One thousand two hundred and thirty-four point zero, zero, five

- What is the value of the digit 1?

Answer: 1 thousand

- What is the value of the digit 5?

Answer: 5 thousandths

Now ask learners to play the following game in pairs or choose to play the game with the whole class.

Place value challenge – a game for 2 players

Players should make a copy of this game board:

	100 000	10 000	1000	100	10	1	0.1s	0.01s	0.001s
Player 1									
Player 2									

They take it in turns to roll a 0–9 dice or spin a 0–9 spinner and write their number in a box on their row of the board. The winner is the player with the highest number when all the boxes have been filled.

Now ask learners to do questions 1–3 of Exercise 1.1 of the Learner's Book.

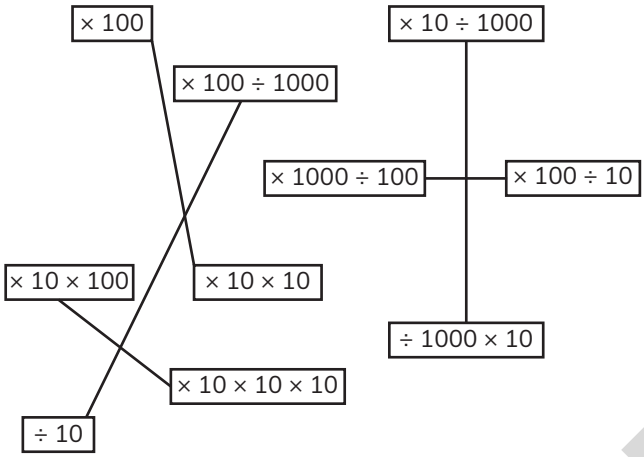
› **Differentiation ideas:** Plan some questions that can be used to support learners who find the concept difficult. For example, mark on your lesson plan particular questions that are straightforward. Provide any learners who are struggling with a place value grid that can be used throughout the lesson. Challenge confident learners to make up games to support less confident learners.

Plenary idea

Multiply and divide (5–10 minutes)

Resources: Calculations for display (see description).

Description: Display the set of calculations as shown here, but do not include the answer lines.



Ask learners to match pairs of equivalent calculations, then ask them to explain their answers by giving a pair of calculations, for example:

× 10 × 100 is equivalent to × 10 × 10 × 10

5 × 10 × 100	5 × 10 × 10 × 10
= 50 × 100	= 50 × 10 × 10
= 5000	= 500 × 10
	= 5000

› **Assessment ideas:** Assess learners' oral explanations. Did they choose suitable numbers? Was their choice of vocabulary appropriate, for example, did they use the word 'equals' correctly?

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

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.1, question 8

In this question, learners must choose and test an example to see if it has a designated answer. When they do this successfully, they are **specialising**.

Encourage learners to spot patterns and relationships. They may recognise that the seven numbers can be placed in order: 0.12, 1.2, 12, 120, 1200, 12 000, 120 000 with each successive number being ten times larger than the one before. A number one thousand times larger than 12 will be three numbers along in the sequence as 1000 = 10 × 10 × 10

You could also encourage learners to find as many ways as possible of finding the answers on the cards. For example, the answer on card A can be described as:

- ten times as big as 120
- ten times smaller than 12 000
- and so on.

CROSS-CURRICULAR LINKS

Different number systems

In this unit learners discover more about our number system, the decimal system, which uses ten digits: 0–9. Learners could investigate the binary system which uses two digits (0 and 1) and the hexadecimal system which uses ten digits and six characters (0–9, A, B, C, D, E, F). Most computers and other electronic devices use the binary system.

Homework ideas

1. Learners can design a poster that shows how to multiply and divide by 10, 100 and 1000. They should use whole numbers and decimals and include drawings, pictures or photographs. They could use real life examples, such as:
   - 1 metre is 100 times as long as 1 centimetre
   - 1 cent is 100 times smaller than 1 dollar.
2. Learners can design a game involving multiplication and division of decimal numbers by 10, 100 and 1000. They could create their own version of 'Three in a row' (see Main teaching idea, Multiplying and dividing by 10, 100 and 1000, Unit 1) or design a new game.

1.2 Rounding decimal numbers

LEARNING PLAN

Framework codes	Learning objectives	Success criteria
6Np.04	• Round numbers with two decimal places to the nearest tenth or whole number.	• Learners round a number with two decimal places to the nearest whole number. • Learners round a number with two decimal places to the nearest tenth.

LANGUAGE SUPPORT

Learners should be familiar with the vocabulary used in this section from their work in Stage 5.

Round: change a number to a simpler value when an accurate answer is not needed.

Nearest: closest to.

Common misconceptions

Misconception	How to identify	How to overcome
Learners do not realise that the nearest whole number or nearest tenth may be different to the whole number or tenth part of the original number. For example, 10.65 is 10.7 to the nearest tenth (and not 10.6).	During discussion and in written work. Make sure that learners do not just delete decimal places to leave the correct number of decimal places.	Demonstrate using a number line and encourage learners to use number lines.
Learners don't use zeros to ensure the correct number of decimal places in the answer. For example: • 22.80 is 22.8 rounded to the nearest tenth • 1.96 is 2.0 rounded to the nearest tenth (and not 2).	In written work and in class discussion (see Main teaching idea, Using decimals to solve problems, Unit 1).	Ensure that you give relevant examples for learners to try.

Starter idea

Rounding Bingo (10 minutes)

Resources: None.

Description: Ask each learner to draw a 2 by 2 grid and write a whole number between 0 and 10 in each cell. Read out a number with 1 decimal place between 0.1 and 9.9 inclusive. Learners must round the number to the nearest whole number. If the answer is on their grid, the learner crosses it out.

For example:

1	~~4~~
7	3

The number 3.9 is called
3.9 is 4 to the nearest whole number
Cross out 4

When all their numbers are crossed out learner calls 'bingo' or another agreed word.

The game can be extended by asking learners to write numbers between 4 and 5 with 1 decimal place in their

grids. This time, read out numbers with 2 decimal places which learners need to round to the nearest tenth.

Main teaching idea

Round a number with two decimal places to the nearest whole number (15–20 minutes)

Learning intention: Round numbers with two decimal places to the nearest whole number.

Resources: Picture for displaying to the class (see description).

Description: Show a picture of someone in a local shop. Explain that the person wants a rough idea (approximation) of what they are spending as they go round the shop. Ask what they might do.

Discuss any ideas that are offered including using a calculator and systems for scanning goods. You may need to guide learners towards the idea that one way of approximating is to round the prices to make them easier to add.

Remind learners that we can round numbers in different ways, for example, in earlier stages, we rounded whole numbers to the nearest 10, 100, 1000. The smaller the number we round to the greater the degree of accuracy, for example:

- 3456 is 3460 to the nearest 10
- 3456 is 3500 to the nearest 100
- 3456 is 3000 to the nearest 1000.

Ask learners to imagine that one item in the shop costs \$5.56. How much is this to the nearest dollar?

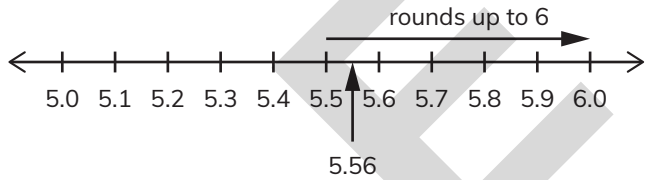
Answer: \$6

Another item costs \$6.05, what is this to the nearest dollar?

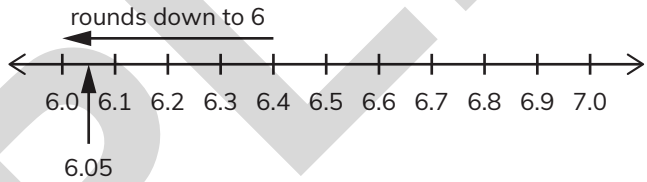
Answer: \$6

Demonstrate these using a number line.

- Round 5.56 to the nearest whole number:



- Round 6.05 to the nearest whole number:



Stress that in each case, we only looked at the tenths digit and then used the same conventions as we used in Stage 5:

To round to the nearest whole number look at the tenths digit:

- if it is less than 5 round down
- if it is 5 or more round up.

Now ask learners to round these numbers to the nearest whole number:

- 67.94

Answer: 68

- 4.58

Answer: 5

- 3.25

Answer: 3

Learners can practise rounding to the nearest whole number by rolling a dice three times to make a number with two decimal places and then round it to the nearest whole number.

4.52 rounds to 5

Now ask learners to do questions 1–3 of Exercise 1.2 of the Learner's Book.

› **Differentiation ideas:** You can support less confident learners by suggesting they draw their own number lines. You can challenge more confident learners to work in pairs to produce a puzzle or game that involves rounding for the rest of the class to use.

Plenary idea

Feedback to the class (10 minutes)

Resources: None.

Description: See Main teaching idea, Using decimals to solve problems, Unit 1. You should warn learners that they are expected to present their findings, to give them time to prepare.

› **Assessment ideas:** Ask learners to give feedback on the presentation, giving as many good points as they can and just one suggestion for improvement. Learners will show they are **critiquing** when they explain their points for improvement.

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

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.2, question 6

In this question, learners must work through statements and decide whether they are correct or not. In this question they are asked to correct those that are not correct. As they do this they are **improving**.

The question asks them to discuss their reasons with their partner and you may need to spend time discussing these with learners, particularly as they relate to common misconceptions. In the first example learners must recognise that the zero is needed in the tenths place otherwise the number is rounded to the nearest whole number. In the final example learners may change the 9 tenths to zero but fail to change the ones to 7. Remind them that $6.9 + 0.1 = 7.0$

If learners are still struggling, then use number lines similar to those in the main activities.

Homework ideas

1. Ask learners to collect examples of numbers used in news items or reports and to say whether the number is likely to be exact or rounded.
2. Ask learners to find an itemised bill or receipt that shows the total cost. They should round the cost of each item to the nearest dollar and then add the values. They should then round the cost of each item to the nearest tenth of a dollar, add them again and compare the two answers. They can use a calculator to help with the addition.

Assessment ideas

- Suggest to learners that they check the Look what I can do! sections and discuss these with their partner, reflecting on their progress through the unit and what they can do to improve their performance.
- **Digital Classroom:** Use the Unit 1 activity with the whole class to check their knowledge. The i button will give you more information.
- Ask learners to complete the Check your progress exercise in the Learner's Book. Address any issues that arise and consider using the worksheets to give learners confidence before they work on the Unit 1 test.

2 Numbers and sequences

Unit plan

Topic	Approximate number of learning hours	Outline of learning content	Resources
2.1 Counting and sequences	3	Count on and back including using negative numbers, fractions and decimals. Find the position-to-term rule for a sequence.	Learner's Book Section 2.1 Workbook Section 2.1 Additional teaching ideas for Section 2.1 Resource sheet 2A Resource sheet 2B Resource sheet 2C Resource sheet 2D
2.2 Special numbers	3	Use knowledge of square numbers to generate a term in a sequence given its position. Use knowledge of multiplication and square numbers to recognise cube numbers (from 1 to 125).	Learner's Book Section 2.2 Workbook Section 2.2 Additional teaching ideas for Section 2.2 Resource sheet 2E Resource sheet 2F Resource sheet 2G
2.3 Common multiples and factors	3	Find common multiples and common factors.	Learner's Book Section 2.3 Workbook Section 2.3 Additional teaching ideas for Section 2.3 Resource sheet 2H Resource sheet 2I
Cross-unit resources			
Digital Classroom: Unit 2 multimedia enhancement **Digital Classroom:** Unit 2 activity Worksheet 2A Worksheet 2B Language worksheet 2A Language worksheet 2B Learner's Book Check your progress Unit 2 test and answers			