



外研社

General Introduction of Science & Mathematics



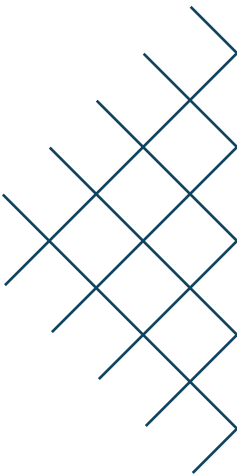


Contents



1. Science

2. Mathematics



Science & Mathematics

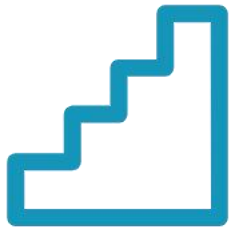
Publisher and authors



外语教学与研究出版社
FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

	Science	Mathematics
Grade 1-3	Jon Board Alan Cross	Cherri Moseley Janet Rees
Grade 4-6	Fiona Baxter Liz Dilley	Emma Low Mary Wood
Grade 7-9	Mary Jones Diane Fellowes-Freeman Michael Smyth	Lynn Byrd Greg Byrd Chris Pearce



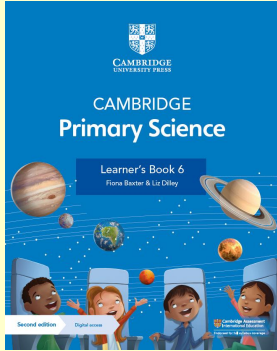
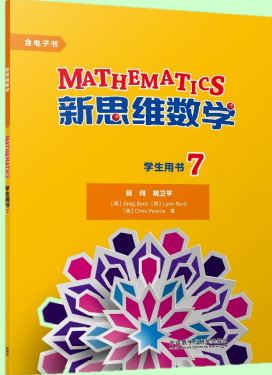
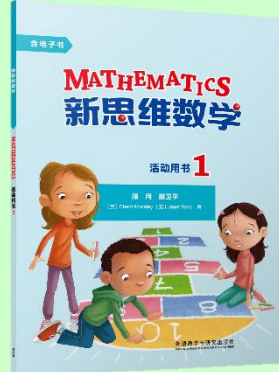
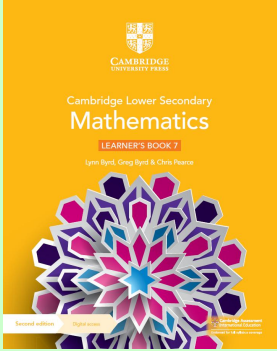
Science & Mathematics



- 9 stages from primary to lower secondary
- Cope with Cambridge Progression Tests
- Cope with Cambridge Checkpoint Tests



Series components

Series components	Science			Mathematics		
	Learner's books	Workbooks	Teacher's resource books	Learner's books	Workbooks	Teacher's resource books
Print components						
Digital components	Digital versions of print components		<ol style="list-style-type: none"> 1. Learning objectives 2. Background knowledge 3. Worksheets 4. Language sheets 5. Tests and answers 6. Vocabulary 	Digital versions of print components		<ol style="list-style-type: none"> 1. Learning objectives 2. Background knowledge 3. Worksheets 4. Language sheets 5. Tests and answers 6. Vocabulary

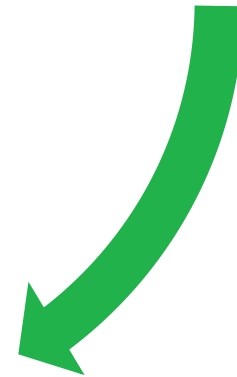
Assessment support overview

- Diagnostic check
- Mid-point test
- End of year test
- End of unit tests

**Summative
assessment**

**Baseline
assessment**

**Formative
assessment**



Science resources walkthrough



01.

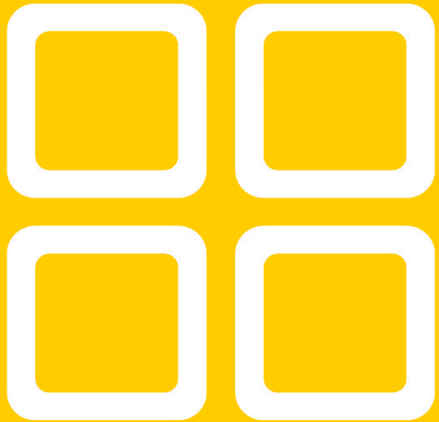
SCIENCE



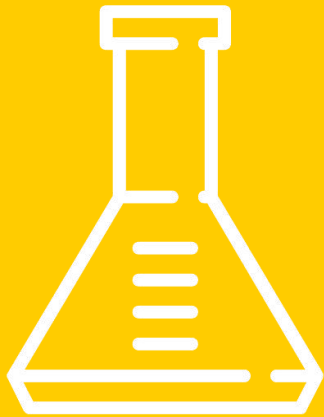
Cambridge Primary and Lower Secondary Science



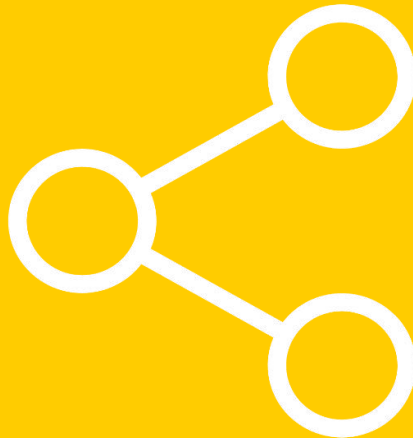
SCIENCE Features



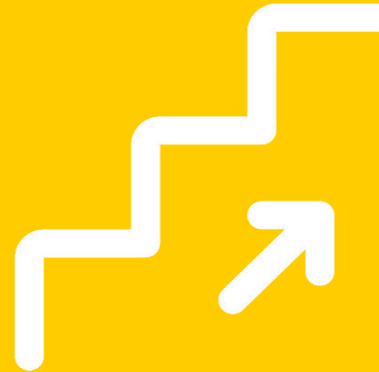
Four content strands



Thinking and Working Scientifically



Science in context



Clear progression through stages

SCIENCE Features



Earth and space

3 Rocks, the rock cycle and soil

What are igneous rocks?

The word 'igneous' means fire. Igneous rocks come from magma that has cooled into solid rock. Magma is hot, like a fire. Look at the diagram. Notice that magma is coming from the mantle, deep below the Earth's surface. When magma cools it turns into a solid. This process is called **solidification**. Some of the magma comes out at the surface as lava. When the lava cools, it solidifies into an **extrusive igneous rock**. 'Extrusive' means outside the Earth's crust on the surface. The photograph on the opening page of this unit shows this happening. The rock is a black rock called **basalt**. Some of the magma stays inside the Earth's crust. It cools down more slowly than the lava and solidifies into an **intrusive igneous rock**. 'Intrusive' means inside the Earth's crust. An example of an intrusive igneous rock is **granite**. On the diagram you can see that when the rocks above the intrusive igneous rock wear away, the granite appears at the surface.

4 Earth and its habitats

Here is a diagram to show the internal structure of the Earth. The structure is made up of different layers: the **crust**, the **mantle** and the **core**.

Crust

The crust is the thin outer layer of the Earth where we live. The crust is formed of rocks. Under the oceans the crust is about 5 km thick. Under the land the crust is about 70 km thick. The temperature of the crust increases from 20°C at the surface to 400°C at its deepest part.

Some of the magma forces its way through cracks in the sides of the volcano. When this magma erupts it forms baby volcanoes called **secondary cones**.

Questions

Look at the photograph of flowing lava on the right.

- 1 Point to the lava that is still flowing.
- 2 Point to the lava that has cooled down and hardened into rocks.

Look at the diagram of a volcano and the photograph of a volcano. The diagram is a model of the real thing.

- 3 Talk about features of the volcano that you can see on the photograph and the diagram.

4 Earth and its habitats

> 4.1 The structure of the Earth

What you are going to do:

- describe a model of the structure of the Earth
- describe how a model can never be a true copy of the real thing

Learning objectives

The photograph of Earth was taken from space.

- 1 What shape is the Earth?
- 2 What does the surface of the Earth consist of?
- 3 What do you think might be underneath the surface?
- 4 The solid white part of the surface of the image is the part of the image that is the blue part of the image. (What do we call this change?)
- 5 What provides the energy that makes the ice change into water?

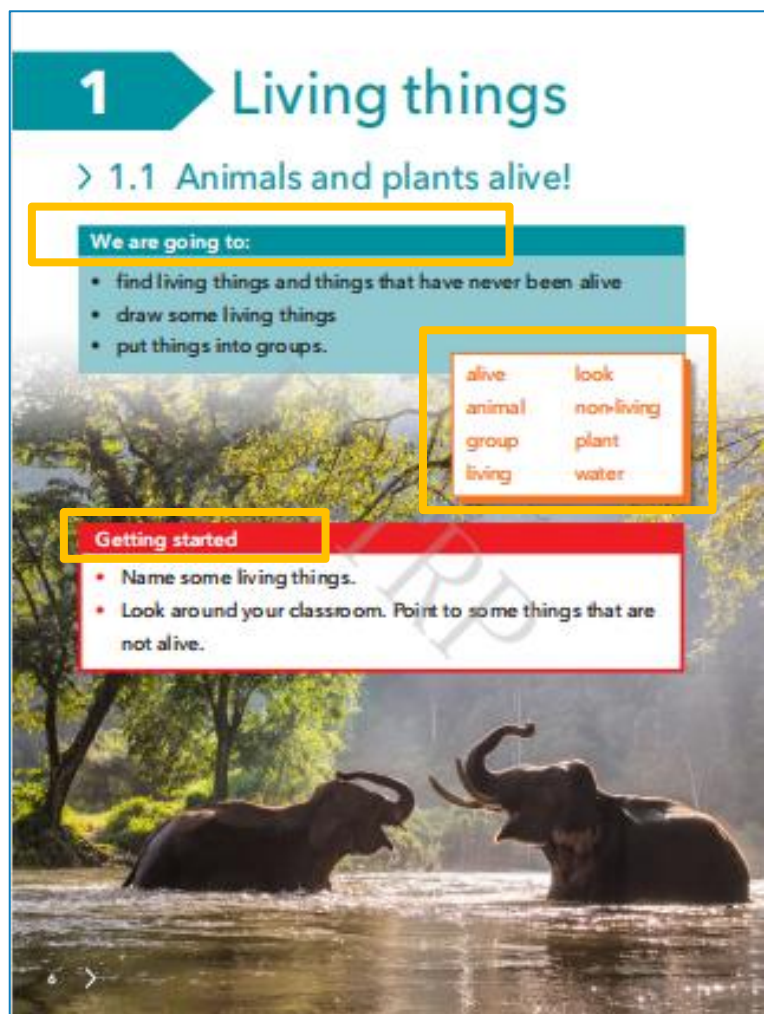
Questions

- 1 Describe the external structure of a peach.
- 2 Draw the second image showing the external structure of the internal structure of a peach?
- 3 Name the two layers which make up the internal structure of a peach.

Brighter Thinking

Better Learning

Four content strands (comprised of Biology, Chemistry, Physics, and Earth and Space)



We are going to

Learners are clear on the lesson focus

Getting started

Helps students think and talk about what they already know

Key Words

Unit specific vocabulary is pulled out



1 Living things

Activity

Living or non-living?

Zara is putting things into two groups.
Where should she put the toy?
What other things could she put in the groups?
Look at the non-living things.
Point to something that used to be alive.
Point to some things that have never been alive.
Make a group of living things and a group of non-living things.
Use things from your classroom.
How do you know which things are alive?

How am I doing?

Ask a friend to look at your groups.
Have you put things in the right group?

How does putting things into groups help you learn science?

Look what I can do!

- ☐ I can name four or more things that are living.
- ☐ I can name four or more things that have never been alive.
- ☐ I can draw some living things.
- ☐ I can put things into two groups.

8 >

4.1 Characteristics of living organisms

- 1 Another word for taking in nutrition is
- 2 Polar bears can sense things in their environment. For example, with their nose they can sense the of meat.
- 3 All living organisms excrete waste substances. Animals excrete when they breathe out.
- 4 Living organisms to make more of the same kind of organism.
- 5 Young plants and animals get bigger. This is called
- 6 All living organisms break down some of the food they eat, to provide them with energy. This happens in a process called
- 7 Most living organisms can change the shape and position of their bodies. This is called

Activity 4.1.1

Is a car alive?

The picture shows a car.

Here are some facts about cars.

- Cars use fuel and oxygen.
- Inside the engine of the car, the fuel and oxygen provide energy to make the car move.
- The engine produces waste gases, including carbon dioxide. These are given off in the exhaust of the car.
- Some cars have sensors. For example, they can sense when it is dark and turn the lights on automatically.

Questions

- 1 In your group, make a list of similarities between a car and living organisms.
- 2 Make a list of differences between a car and living organisms.

Summary checklist

- ☐ I can list the seven characteristics of living organisms.
- ☐ I can describe the meaning of each of these characteristics.

129 >

Activity

Helps students use
their scientific enquiry
skills



1.1 Animals and plants alive

Use your eyes to **look** at the picture. What can you see?

Point to a **plant**. Most plants are green.

Plants make their own food.

Point to an **animal** in the picture.

Animals move around and eat other things.

Plants and animals are **alive**.

They are **living** things.

All living things need food.

Water moves but it is not alive.

Point to what is **non-living** in the picture.

Think like a scientist

What living things can we find?

You will need:

paper, a pencil, a clipboard or thick card to rest on,
a digital camera

Go outside to look for living things.

**Be careful in case there are plants or animals
that are prickly, sting or bite.**

Try to find four living things.

Draw and photograph some living things.

What is the largest living thing
you can find?

What is the smallest living thing
you can find?

**Think like a scientist**

Provides learning objectives describing
the approaches to scientific thinking
and working that need be developed
across the four content strands



1 Living things

Activity

Living or non-living?
Zara is putting things into two groups.
Where should she put the toy?
What other things could she put in the groups?
Look at the non-living things.
Point to something that used to be alive.
Point to some things that have never been alive.
Make a group of living things and a group of non-living things.
Use things from your classroom.
How do you know which things are alive?



How am I doing?

Ask a friend to look at your groups.
Have you put things in the right group?

How does putting things into groups help you learn science?

Look what I can do!

- ☐ I can name four or more things that are living.
- ☐ I can name four or more things that have never been alive.
- ☐ I can draw some living things.
- ☐ I can put things into two groups.

8 >

Look what I can do!

Opportunities for students to self
assess their learning help them
develop reflection skills



Check your progress

Check your progress

Talk about these questions.

1 Which pictures show a sound source?



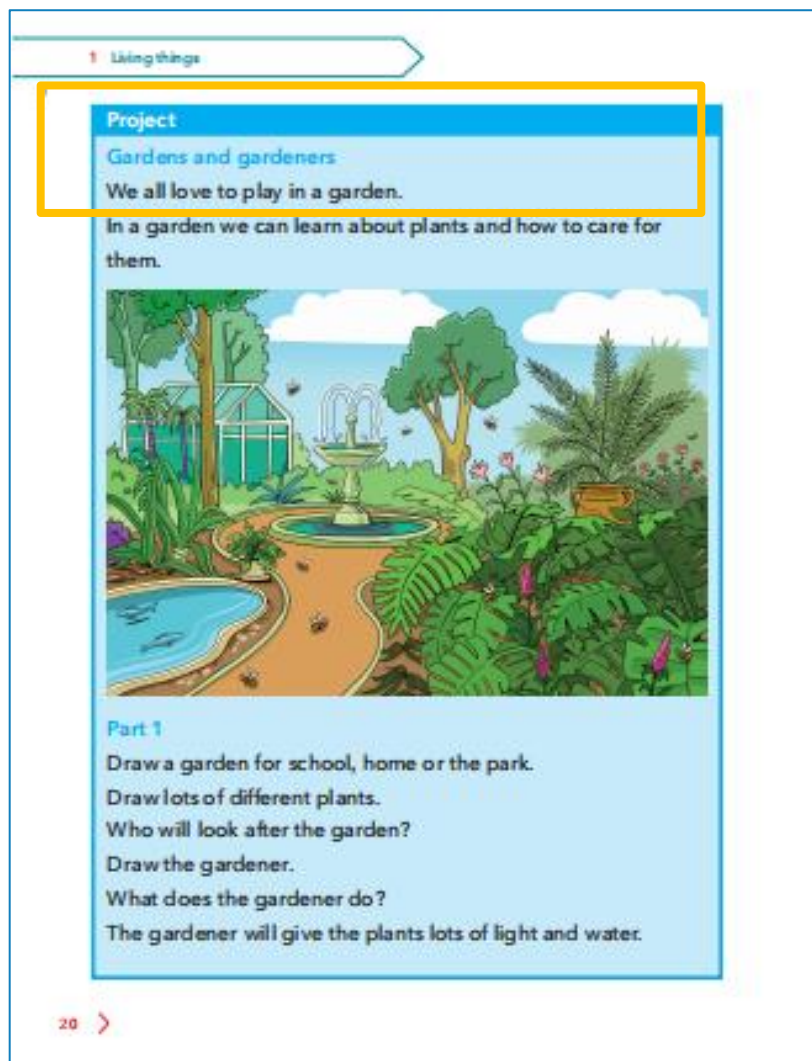
2 What might happen to this girl's ears?



43 >

Check your progress

Provides exam-style questions that can be used as an end of unit test



Project

Helps with assessment for learning
and promotes cross-curricular links



1 Living things

> 1.1 Animals and plants alive!

Focus

1 Colour in only the things that are alive.



Focus

Build learners' foundation skills within a topic

1.1 Animals and plants alive!

Practice

2 Draw lines from these things to the right group.



lion



Sun



tree

Non-living

Living



water



butterfly



chair

Practice

Provide more opportunities for practice

6.5 Magnets can pull

Challenge

4 Magnets pull magnetic materials towards them.

Look at the pictures. Some materials are magnetic and other materials are non-magnetic.

Draw arrows to show the pulling force on the magnetic materials.



Why does the magnet not pull on the rubber balloon?

Challenge

Stretch and challenge learners even further

SCIENCE Teacher's resource

> Contents

Introduction	4
About the authors	5
How to use this series	8
How to use this Teacher's Resource	10
About the curriculum framework	12
About the Cambridge International assessment	13
Approaches to teaching and learning	13
Setting up for success	15

Teaching notes

1 Cells	1
2 States of matter	23
3 Forces and energy	60
4 Grouping and identifying organisms	102
5 Properties of materials	127
6 Earth physics	155
7 Microorganisms in the environment	187
8 Changes to materials	212
9 Electricity	238

- Introduction to key approaches to learning and teaching
- Overview of components in the series
- Overview of the curriculum framework
- Curriculum framework correlation chart
- Lesson plan template
- Scheme of work



SCIENCE Teacher's resource

> 1 Respiration

Unit plan

Topic	Learning hours	Learning content	Resources
1.1 The human respiratory system	2	Structure of the respiratory system	Learner's Book: Questions 1–2 Think like a scientist: Looking at lungs Activity 1.1.1: What does the larynx do? Workbook: Exercise 1.1 Structure and function in the respiratory system Other components: Worksheet 1.1 Journey into the lungs
1.2 Gas exchange	2	Structure of air sacs; movement of oxygen and carbon dioxide between air sacs and blood; comparing the composition of inspired and expired air	Learner's Book: Activity 1.2.1: Gases in and out Think like a scientist: Why are air sacs so small?, including questions 1–3 Think like a scientist: Comparing the carbon dioxide content of inspired air and expired air, including questions 4–8 Workbook: Exercise 1.2 Lung surface area and body mass
1.3 Breathing	2	How air is moved into and out of the lungs	Think like a scientist: Measuring the volume of air you can push out of your lungs, including Questions 1–2 Think like a scientist: Using a model to represent breathing movements, including Questions 3–6 Learner's Book: Questions 1–2 Workbook: Exercise 1.3A Measuring lung volumes Exercise 1.3B Looking at data on lung volumes Exercise 1.3C Lung volume at different ages Other components: Worksheet 1.3 Respiratory system leaflet

1 RESPIRATION

CAMBRIDGE LOWER SECONDARY SCIENCE 8: TEACHER'S RESOURCE

Topic	Learning hours	Learning content	Resources
1.4 Respiration	2	How useful energy is released from glucose inside mitochondria	Learner's Book: Questions 1–3 Think like a scientist: Investigating respiration in peas, including Questions 1–6 Activity 1.4.1: Thinking about a thermogram Activity 1.4.2: Explaining the difference between breathing and respiration Workbook: Exercise 1.4 Respiration by yeast Other components: Worksheets 1.4A B and C An investigation using hydrogen carbonate indicator
1.5 Blood	2	Structure of blood and functions of its components; how blood transports oxygen and glucose for respiration	Learner's Book: Questions 1–4 Activity 1.5.1: Making a picture of blood Workbook: Exercise 1.5A The components of blood Exercise 1.5B Functions of blood components Exercise 1.5C Rats at altitude Other components: Worksheets 1.5A, B and C Adapting to high altitude
Topic	Check your progress	Project for SiC	Language development worksheets
End of unit	Questions 1.1–1.4	Helping white blood cells to protect us from pathogens	1.1 Completing sentences about respiration 1.2 Explaining the meanings of words

BACKGROUND KNOWLEDGE

Learners will know that respiration is one of the characteristics of living organisms. Some may also know that it involves the release of energy from glucose. They learnt about the structure of cells in Stage 7, and so should be aware of mitochondria. Learners who followed the Cambridge programme at Stage 6 will have learnt the basic structure of the human respiratory system, and they should know that oxygen moves from air into the blood in the lungs. However, they are unlikely to know about air sacs, or about the movement of carbon dioxide from the blood to the air inside the lungs. At Stage 5, they will have used the particle model to describe solids, liquids and gases, which will help them to understand how particles of oxygen and carbon dioxide can move between air sacs and the blood. They are unlikely to know about

diffusion, which is covered later in this book in Topic 3.7, Particles on the move. The movement of air into and out of the lungs by breathing movements is a difficult topic at this level, and needs to be approached with care, giving learners time to absorb the various concepts involved. The relationship between pressure and volume will be covered in more detail in Topic 3.6, Pressure in liquids and gases. At Stage 6, learners will have dealt with the human circulatory system, including its function in transporting oxygen. Note that this topic covers only the structure and functions of blood; there is no need to consider the heart or blood vessels in any detail. Learners will have learnt about the structure and function of red blood cells at Stage 7, Topic 1.3.

Topics that appear in each unit along with suggested number of teaching hours, relevant components that are appropriate

Background subject content for teachers to familiarise themselves with the scientific content

SCIENCE Teacher's resource

1 RESPIRATION

TEACHING SKILLS FOCUS

Organising practical work

Hands-on practical activities are an extremely important component of any modern science course. Learners experience for themselves how a variety of scientific apparatus and procedures are used. For many learners, doing an experiment themselves makes it much easier for them to understand the topic they are studying.

Thinking carefully about how you organise practical work with your class can make the experience for both you and your class much more enjoyable and successful. Here are some ideas you might like to consider.

- Before attempting to do any practical work, it is essential that learners understand the rules for behaviour in a laboratory. Schools should have their own set of rules, which are the same in every laboratory, and display them prominently on the wall. They must be fully enforced by every science teacher.
- You may like to have a supply of safety glasses and laboratory coats for learners to use when they are doing practical work. Putting on a lab coat can help them to feel responsible as they work.
- It is very unlikely that you will have an emergency, but you should have in place a procedure with which you and the learners are familiar. You should be able to tell learners to stop what they are doing immediately, and know that they will respond appropriately. This may require practice. It is important, however, not to scare learners and make them nervous of doing practical work. Laboratories can often be among the safest places in the school, because learners know how to behave sensibly there.
- Some basic apparatus (such as test tubes, retort stands) can be stored so that learners can find and collect it for themselves when asked to do so. Label each cupboard with the name of the apparatus that is kept inside; you can include a drawing or photograph of the apparatus on the cupboard door as well, to help learners who are not sure of the names.
- It is a good idea to keep the apparatus on trays inside the cupboards. You can then take

a tray of, for example, small beakers out of the cupboard when needed and place it on the bench, to make it easier for learners to collect one. Make sure that you place the trays at different places around the room, to avoid learners all standing in the same place as they collect their apparatus.

- When working in groups, one person can take responsibility for collecting the apparatus, to avoid everyone crowding around at the same time. If there is a lot to collect, then arrange for one person from each group to collect some of it, and another to collect the rest. You can also ask one group at a time to collect their apparatus, rather than everyone at once. Make sure that different groups do this in different sequences each time.
- If you have a large class, or a class where learners are unused to being able to move around in the room, or are unfamiliar with laboratory rules, problems may arise if they are asked to collect their own materials. Instead, you can take a tray of the required apparatus to each group or each bench. Later, as learners get more used to working in a laboratory, you can move towards expecting them to collect their own apparatus.

As a challenge, in this unit you could try the *Think like a Scientist* tasks in Topic 1.2, *Think like a scientist: Why are air sacs so small?* and *Think like a scientist: Comparing the carbon dioxide content of inspired air and expired air*. Settle the groups at their places, then take the prepared apparatus in trays to each group. Then, in Topic 1.4, *Think like a scientist: Investigating respiration in peas*, set out the apparatus at the front of the laboratory, and ask one person from each group to come and collect it. Plan how you will clear up when the practical session is over. Will learners do their own washing up, or will you or a laboratory technician do this? Where will learners place dirty or washed apparatus? Have a method in place to trap any solids that might be thrown away, to stop them going down the sink – you can tie a sieve (the type that you use in a kitchen) to each tap, for convenience.

CAMBRIDGE LOWER SECONDARY SCIENCE 8: TEACHER'S RESOURCE

CROSS-CURRICULAR LINKS

English language: Learners will use English language skills to construct their story for Worksheet 1.1.

Topic 1.1: The human respiratory system

LEARNING OBJECTIVES

Curriculum reference	Learning intentions	Success criteria
8Bs.03 Describe how the structure of the human respiratory system is related to its function (in terms of lung structure).	• Learn about the structure of the human respiratory system. (LB, WB)	• Name the parts of the respiratory system on a diagram.
8TW5c.07 Collect and record sufficient observations in an appropriate form.	• Use a range of senses to observe the structure of lungs. (LB)	• List, in order, the parts of the respiratory system that air passes through.

LANGUAGE SUPPORT

Helping learners to learn the names of the parts of the respiratory system and to outline their functions; encouraging use of these names and giving confidence in pronouncing and using these words. Learners will use the following words:

respiration: a chemical reaction that takes place in all living cells, in which energy is released from glucose

aerobic respiration: a form of respiration in which oxygen is combined with glucose; it takes place inside mitochondria

respiratory system: the system involved with providing oxygen to the blood and removing carbon dioxide, so that respiration can take place in cells

trachea: a tube leading from the back of the throat, through which air travels into the lungs; it has C-shaped rings of cartilage in it to support it

windpipe: another name for the trachea
cartilage: a tough but bendy material that provides support to the trachea

bronchus: one of two tubes that convey air from the trachea into the lungs

bronchiole: one of many small tubes that carry air through the lungs, from the bronchi

air sac: a tiny blind-ending sac in the lungs, in which gas exchange takes place between the air and the blood; also known as an alveolus

larynx: the organ at the top of the trachea that contains the vocal cords

voicebox: another name for the larynx

vocal cords: bands of muscle that stretch across inside the larynx, which we vibrate to make sounds

Cross-curricular links point out where teachers can make links with other subjects

Learning objectives are based on curriculum references, learning intentions and success criteria

Language support feature includes definitions for quick reference for teachers, advice for teachers on challenges that students may face with language

Teaching skills focus is aimed at teachers wanting to develop their skills and challenge themselves.

SCIENCE Teacher's resource

Common misconceptions feature highlights what learners might misinterpret and how to address them

Starter ideas to grab attention and generate interest in a particular topic

1 RESPIRATION

Common misconceptions

Misconception	How to elicit	How to overcome
Learners may think that the lungs are where respiration takes place; it is very common for there to be confusion between gas exchange and respiration.	Ask learners to do the Getting started activity. You can ask questions as you demonstrate the structure of sheep or goat lungs.	Constant reinforcement is likely to be required, to emphasise the difference between gas exchange and respiration and also (later) breathing.

Starter ideas

1 Getting started (10 minutes, including sharing ideas)

Description: Ask learners to work with a partner to decide which statements are correct. There is no need to write down answers. Then ask some of the pairs to give their suggested answers, orally. Use their ideas to discover any wrong preconceptions about respiration, which you can address later in the lesson. Any wrong decisions about which statement of a pair is correct, or even slight uncertainty about this, will reveal misconceptions.

2 Lungs (5–10 minutes)

Resources: Lungs from a sheep or a goat, to be used later in the demonstration, *Think like a scientist: Looking at lungs*

Description: Before learners enter the room, place the lungs on dissecting board or in a large container, and cover.

Bring learners to the front of the class. Ask them to guess what is under the cover. They can ask questions, but you can only answer 'yes' or 'no'. You can give clues if they do not get close.

Uncover the lungs. Ask learners what they think they are, and what they do. There may be incorrect ideas about respiration happening only in the lungs.

You could now go straight into the *Think like a scientist* demonstration, or put the lungs on one side and start the main lesson using the diagram of the respiratory system in the Learner's Book.

Main teaching ideas

1 The parts of the human respiratory system (20–25 minutes)

Learning intention: To be able to identify and name the different parts of the human respiratory system, and to outline their functions

Resources: Learner's Book Topic 1.1, diagrams of positions of lungs in the body and of the human respiratory system

If possible, show a large copy of the second diagram on the board or screen.

If available, a model of the human body with removable organs.

Description: Use the diagrams, models and video clips to talk about the structure of the respiratory system. Say the names of each part carefully, repeating them often. Use questioning to involve learners, and encourage them to say the names of the parts.

You could provide learners with an unlabelled version of the diagram, for them to stick into their notebooks and label.

If you have Digital Classroom, learners can drag and drop labels onto the diagram and hear the words spoken.

Ask learners to answer questions 1 and 2, either orally or by writing the answers in their notebooks.

> **Differentiation Ideas:** Some learners may need help to label the diagram, and to answer the questions. Learners who need a challenge could draw the diagram in their notebook, rather than being provided with an unlabelled version to stick in.

> **Assessment Ideas:** Check that learners are confident in pronouncing the names of the parts of the respiratory system. Check answers to Questions 1 and 2.

2 Think like a scientist: Looking at lungs (15–20 minutes)

Learning intention: To consolidate understanding of the structure of the respiratory system

CAMBRIDGE LOWER SECONDARY SCIENCE 8: TEACHER'S RESOURCE

Resources: A fresh set of lungs obtained from a butcher – these are often readily available; sheep or goat lungs are ideal (if you have to obtain these the day before the lesson, make sure that they are kept in a fridge so that learners are not put off by strong smells); a dissecting board or large bowl in which to place the lungs; access to warm water, soap and towels, for washing hands; clipboards for learners to make notes or drawings, if appropriate

Description: Bring learners to the front. If any learners say that they do not want to watch, do not attempt to persuade them, but simply allow them to sit quietly at the back of the class, where they cannot see the lungs. These learners may decide to watch the demonstration once it has begun.

Demonstrate the structure of the lungs and the tubes leading into them. Allow learners to touch the lungs – they should feel how soft and spongy they are. They can also feel the cartilage rings in the trachea.

Talk through the questions and encourage learners to suggest their answers.

When the demonstration has finished, make sure that everyone washes their hands thoroughly.

They can then return to their places and write the answers to the questions.

If no set of lungs is available, a series of images showing the different parts of the lung, or a video clip showing the different structures of the lung or a video clip of a lung dissection can be used.

> **Differentiation Ideas:** This task works well with learners of all abilities. Differentiation is by outcome, where there will be a range of answers to the questions.

> **Assessment Ideas:** Listen to any questions as you demonstrate the lungs. Listen to answers from learners, and mark their written answers to the questions.

3 What does the larynx do? (5–10 minutes)

Learning intention: To practise observing carefully through touch and hearing

What the idea is good for: Helping learners to appreciate that observations can be made with all of our senses, not just sight.

Linking what they have learnt about the respiratory system to their own body.

Description: Ask each learner to follow the instructions in the Learner's Book for this activity. They can do this individually, while seated at their desks.

> **Differentiation Ideas:** Some learners may need help in finding their larynx and in being able to feel differences in its position when they make different sounds. Some learners may be able to relate the higher frequency of vibration to the higher pitch of a sound.

Plenary ideas

1 Naming the parts of the respiratory system (5 minutes)

Description: Draw or project an unlabelled image of the respiratory system on the board. Ask a learner to name a part of the system. Ask another learner to come and label this part on the board. Repeat with each part.

> **Assessment Ideas:** Use answers to check learners' ability to recognise and name the parts of the respiratory system.

Check that learners can pronounce and spell the names correctly.

2 Mastermind (5 minutes)

Resources: A card for each learner, with a tick (✓) on one side and a cross (×) on the other side

Description: Choose a learner (or ask for a volunteer) to be 'Mastermind'.

Ask this learner a question about the respiratory system, based on the work done in this lesson.

The Mastermind gives an answer – they can choose to give a wrong answer if they wish to.

The other members of the class hold up their cards, with the tick or cross showing, to show whether the answer is correct or incorrect.

You can then interrogate the rest of the class to find the correct answer if necessary, or to find out why a learner has identified a correct answer as a wrong one.

Repeat with more questions to the same Mastermind.

> **Assessment Ideas:** Use responses of the class to identify any misunderstandings.

Plenary ideas include opportunities for consolidation and self/peer assessment against success criteria

SCIENCE Teacher's resource worksheets

Name _____ Date _____

> CAMBRIDGE LOWER SECONDARY SCIENCE STAGE 7 UNIT 1: WORKSHEET PACKS

Worksheet: 1.1A

Plant cell structure and function

The function of something is the job that it does.
Use a ruler to draw a line from each part of a plant cell to its function.

part of plant cell	function
cell wall	where the plant makes its food
cell membrane	controls the activities of the cell
cytoplasm	a clear jelly where chemical reactions happen
chloroplast	a space containing a solution of sugars in water
nucleus	a thin layer around the outside of the cell that controls what goes into and out of the cell
mitochondrion	a strong layer of cellulose that helps to hold the cell in shape
sap vacuole	where energy is released from food

Name _____ Date _____

> CAMBRIDGE LOWER SECONDARY SCIENCE STAGE 7 UNIT 2: STATES OF MATTER

2.1 Vocabulary - words about changes of state

Match these words about changes of state to their meanings.

melting	equipment used to measure temperature
thermometer	the curved surface of a liquid, best seen in a narrow tube.
meniscus	the process when a solid changes state and becomes a liquid
condensing	equipment for measuring the volume of a liquid
measuring cylinder	the space something takes up
volume	the process when a gas changes state and becomes a liquid

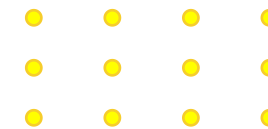
- Worksheet and language worksheet packs to accompany the teacher's resource
- End of unit, diagnostic, mid-point and end of year tests also provided

Mathematics resources walkthrough



02.

MATHEMATICS

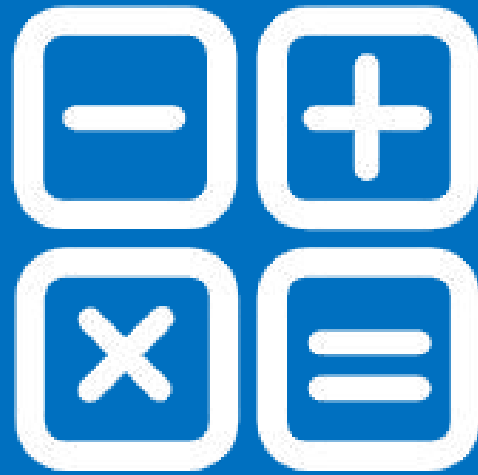


Cambridge Primary and Lower Secondary Mathematics

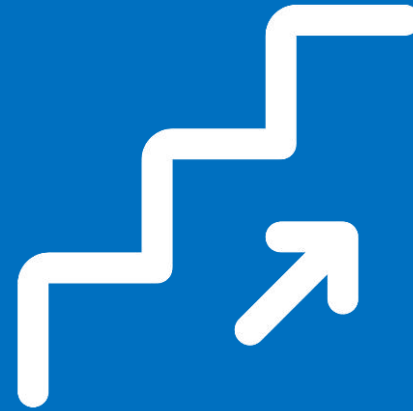
MATHEMATICS Features



Thinking and
Working
Mathematically

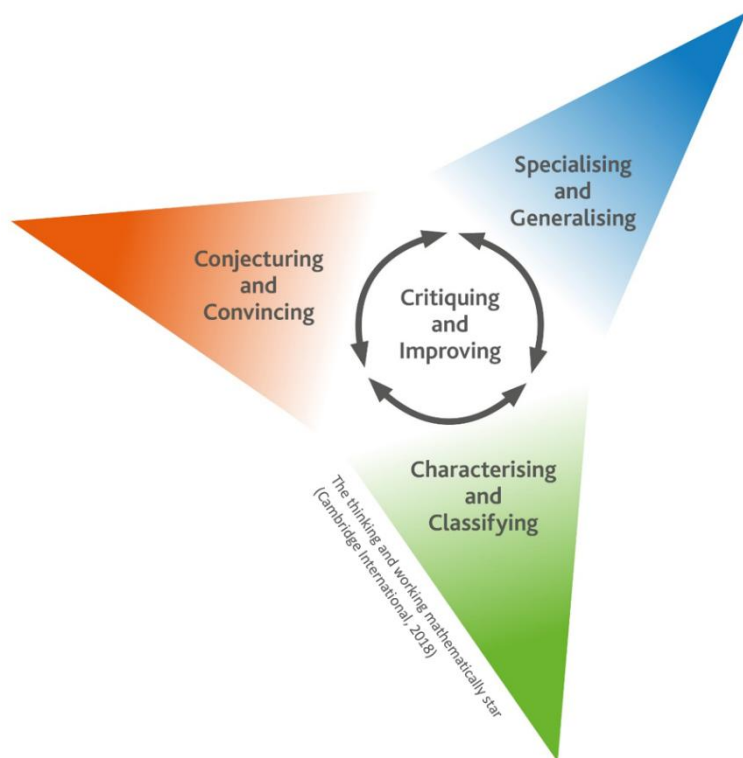


Four content
strands



Clear
progression
through stages

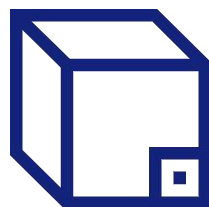
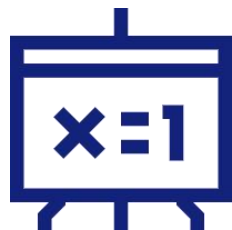
MATHEMATICS Features



Thinking and Working Mathematically characteristic	Definition
Specialising	Choosing an <i>example</i> and checking to see if it satisfies or does not satisfy specific mathematical criteria
Generalising	Recognising an underlying pattern by identifying <i>many</i> examples that satisfy the same mathematical criteria
Conjecturing	Forming mathematical questions or ideas
Convincing	Presenting evidence to <i>justify or challenge</i> a mathematical idea or solution
Characterising	Identifying and describing the mathematical properties of an object
Classifying	Organising objects into groups according to their mathematical properties
Critiquing	Comparing and evaluating mathematical ideas, representations or solutions to identify advantages and disadvantages
Improving	Refining mathematical ideas or representations to develop a more effective approach or solution

Thinking and Working Mathematically

MATHEMATICS Features



1.1 Counting sets of objects

LEARNING PLAN		
Framework codes	Learning objectives	Success criteria
1Nc.01	<ul style="list-style-type: none">Learners can successfully count any collection of up to 10 objects.	<ul style="list-style-type: none">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	<ul style="list-style-type: none">Recognise the number of objects presented in familiar patterns up to 10, without counting.	<ul style="list-style-type: none">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.
1Np.01	<ul style="list-style-type: none">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.
1Nc.03	<ul style="list-style-type: none">Understand that zero represents none of something.	Learners can label an empty box, a blank domino and other examples with 0.

Four content strands (comprised of Number, Algebra, Geometry and Measure, Probability and Statistics)

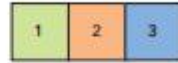
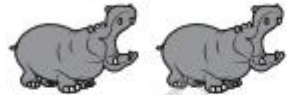
1

Numbers to 10

Getting started

1 How many hippos are there?

Draw a ring around the number that matches the set.



2 Count the toys and write the numbers.



3 Write some numbers you know in the space below.

Tell your partner something about each of the numbers you wrote.

Getting started

Helps students think and talk about what they already know

1 Numbers to 10

> 1.1 Counting sets of objects

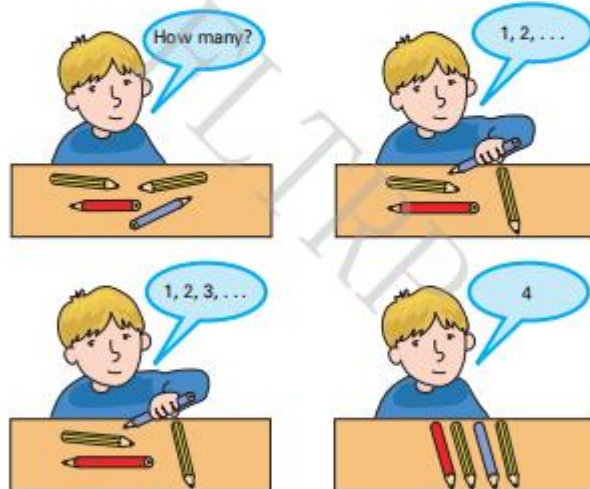
We are going to ...

- count sets of objects.

You need to say the numbers in the correct order to count.

To count objects, start with 1 and say a number for each object.

The last number you say tells you how many objects there are.



count estimate how many set total

We are going to
Identification of section aims for learner

1.1 Counting sets of objects

Draw 0 counters  in the ten frame below.

0

Worked example 1

Which domino has 4 spots?



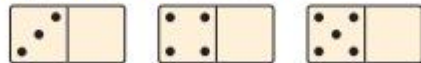
Answer:



This one!

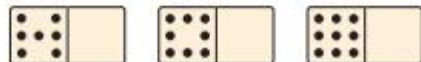
4 Which domino has 5 spots?

Draw a ring around the correct domino.



5 Which domino has 9 spots?

Draw a ring around the correct domino.



Worked example

Simple worked examples

Learner's book






1 Numbers to 1000

Exercise 1.1

1 Complete these pieces, which are from a 1 to 1000 number strip.

1 Numbers to 10

8 Look at the picture on the previous page.
Estimate then count. Write the numbers.

				
Estimate	Estimate	Estimate	Estimate	Estimate
Count	Count	Count	Count	Count

Let's investigate

Work with a partner.

Make a poster all about a number.
Talk about your poster with your class.

Look what I can do!

- I can count objects and write the matching number. ☐ ☐
- I can find or draw the correct number of objects. ☐ ☐
- I can say how many objects are in some sets without counting. ☐ ☐
- I can give a good estimate of how many objects there are. ☐ ☐

☐

☐

☐

☐

☐

☐

☐

☐

18

➤

Exercise

Increasing number of practice questions

Let's investigate

Group or pair activity

MATHEMATICS Learner's book

1.1 Hundreds, tens and ones

6 Use these number words to write four 3-digit numbers in words.

hundred

eight

and

seventy

fifty

three

1 _____

2 _____

3 _____

4 _____

Look what I can do!

- ☐ I can say, read and write numbers and number words from 0 to 1000.
- ☐ I know the value of each digit in a 3-digit number.
- ☐ I can count on and count back in steps of 1 and 10 from any number.




Look what I can do!


Self-assessment checklist

Check your progress


- 9 Sequences and functions
- For each of these infinite sequences, work out:
 - the term-to-term rule
 - the next two terms
 - the 10th term
 - 6, 8, 10, 12, ...
 - 9, 15, 21, 27, ...
 - 28, 25, 22, 19, ...
 - Write down the first four terms of the sequence that has a first term of 5 and a term-to-term rule of: Multiply by 3 then subtract 5.
 - This sequence of patterns is made from squares.



pattern 1
5 squares



pattern 2
10 squares

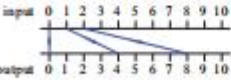


pattern 3
15 squares

 - Draw the next pattern in the sequence.
 - Copy and complete the table to show the number of squares in each pattern.


Pattern number	1	2	3	4	5
Number of squares	5	10			
 - Write down the term-to-term rule.
 - How many squares will there be in pattern 10?
 - Work out the n th term rules for both of these sequences.
 - 3, 6, 9, 12, 15, ...
 - 8, 9, 10, 11, 12, ...
 - For both sequences in Question 4, use your n th term rules to work out the 10th term.
 - Work out the first four terms of both of these sequences.
 - n th term = $5n$
 - n th term = $n - 7$
 - Copy this function machine and work out the missing input and outputs.

input	1	3	
output		12	
 - Tarun draws this mapping diagram for a function.



Copy and complete this function machine and table of values for the same function.

Input			
Output			



Check your progress

Provides exam-style questions that can be used as an end of unit test

MATHEMATICS Learner's book

9 Sequences and functions

> Project 4

Mole and goose

Shown is a section of a horizontal number line.

-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

A goose walks along the number line and stops sometimes to lay an egg.

She likes to space her eggs out equally. For example, she might lay her eggs at 2, 7, 12, 17, 22, ...

A mole digs a tunnel below the number line. It likes to dig up to the surface every so often, to see how far it has dug. It always pokes out its head at equally spaced intervals. For example, it might poke out its head at 1, 4, 7, 10, 13, ...

When the mole visits 7, it finds an egg there! Where else will the mole find an egg?

Choose a starting number for each animal, and decide how far each animal will travel at each step of the sequence.

Does the mole find an egg? Does it find more than one egg?

Can you find some pairs of sequences in which the mole finds more than one egg?

How can you predict how far apart the mole finds the eggs?

Can you find some pairs of sequences in which the mole never finds an egg?

What is special about the size of the steps in these sequences?



Project

Helps with assessment for learning and promotes cross-curricular links

1.1 Counting and sequences

Exercise 1.1

Focus

- 1 Hassan shaded in grey these numbers on a hundred square. The numbers form a pattern.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- a What is Hassan's rule for finding the next number?

- b What is the next number in his pattern?

- 2 The sequence 10, 16, 22, ... continues in the same way. Write the next two numbers in the sequence.
_____, _____

7 >

1 Numbers and the number system

- 3 The rule for a sequence of numbers is 'add 3' each time.
1, 4, 7, 10, 13, ...

The sequence continues in the same way.

Circle the numbers that are not in the sequence.

22 28 33 40

- 4 A sequence has the first term 2020 and the term-to-term rule is 'add 11'. Write the first five terms of the sequence.

- 5 Write the next four terms in these linear sequences.

a 10, 7, 4, _____, _____, _____, _____

b -9, -7, -5, _____, _____, _____, _____

c 1095, 1060, 1025, _____, _____, _____, _____

Tip

Remember that -9 is less than -7.



Practice

- 6 Here is part of a number sequence. The numbers increase by 25 each time.

25, 50, 75, 100, 125, ...

Circle all the numbers below that will be in the sequence.

355 750 835 900 995

8 >

1.1 Counting and sequences

- 7 Amy makes a number sequence. The first term of her sequence is 1. Her term-to-term rule is 'add 7'. Amy says, 'If I keep adding 7, I will reach 77.' Is Amy correct? Explain your answer.

- 8 Here is part of a number sequence. The first number is missing.

$\xrightarrow{-5}$ 297 $\xrightarrow{-5}$ 292 $\xrightarrow{-5}$ 287

Write the missing number.

- 9 A sequence has first term 1001 and last term 1041. The term-to-term rule is 'add 5'. Write down all the terms in the sequence.

- 10 Each number in this sequence is double the previous number. Write the missing numbers.
_____, 3, 6, 12, 24, 48, _____

Challenge

- 11 Write the missing number in this sequence.
1, 3, 6, 10, _____
Explain how you worked it out.

9 >

MATHEMATICS Teacher's resource



Easy-to-view
breakdown of
sections,
estimated
timings, content
and resources

Clear list of
additional
resources that
can be
downloaded
from digital
access



CAMBRIDGE PRIMARY MATHEMATICS 5: TEACHER'S RESOURCE

> 1 The number system

Unit plan

Topic	Approximate number of learning hours	Outline of learning content	Resources
1.1 Understanding place value	4 hours	Explain the value of a digit in a decimal (tenths and hundredths). Multiply and divide whole numbers by 1000. Multiply and divide decimals by 10 and 100. Compose, decompose and regroup numbers, including decimals (tenths and hundredths).	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
1.2 Rounding decimal numbers	3 hours	Round numbers with 1 decimal place to the nearest whole number.	Learner's Book Section 1.2 Workbook Section 1.2 Additional teaching ideas for Section 1.2 Resource sheet 1E Resource sheet 1F

Cross-unit resources

Diagnostic check and mark scheme
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


1 THE NUMBER SYSTEM

Thinking and Working Mathematically questions in Unit 1

Questions	TWM characteristics covered
Learner's Book	
Exercise 1.1 question 8	TWM.07
Exercise 1.1 question 9	TWM.06
Exercise 1.2 question 5	TWM.04
Exercise 1.2 question 6	TWM.01
Check your progress question 8	TWM.01
Workbook	
Exercise 1.1 question 11	TWM.01
Exercise 1.1 question 13	TWM.01
Exercise 1.1 question 17	TWM.07
Exercise 1.2 question 2	TWM.02
Exercise 1.2 question 4	TWM.02
Exercise 1.2 question 10	TWM.02
Exercise 1.2 question 11	TWM.06

BACKGROUND KNOWLEDGE

We are surrounded by numbers in our everyday life. Some of these are whole numbers and some are decimals. Having a display of pictures in the classroom can help learners to see how numbers affect their lives.



In earlier stages, learners used place value charts to help them understand place value. In Stage 4, learners worked with whole numbers, reading and writing them correctly. Learners understood and explained how the value of each digit was determined by its position in a number.

List of questions that can be used to encourage specific Thinking and Working Mathematically skills

Background knowledge on skills students should already have encountered and second section on teaching skills



MATHEMATICS Teacher's resource



Learning plan connects the learning intentions of the unit to the curriculum framework references

Language support explains the critical vocabulary needed for the unit



Common misconceptions about specific skills, how to identify them and how to overcome them are highlighted for each unit

Quick starter ideas to begin a lesson



CAMBRIDGE PRIMARY MATHEMATICS 5: TEACHER'S RESOURCE

1.1 Understanding place value

Learning objectives	Learning intentions	Success criteria
5Np.01	Understand and explain the value of each digit in decimals (tenths and hundredths).	Learners explain the value of a digit in a decimal (tenths and hundredths).
5Np.02	Use knowledge of place value to multiply and divide numbers by 10, 100 and 1000.	Learners multiply and divide whole numbers by 1000.
5Np.03	Use knowledge of place value to multiply and divide decimals by 10 and 100.	Learners multiply and divide decimals by 10 and 100.
5Np.04	Compose, decompose and regroup numbers including decimals (tenths and hundredths).	Learners compose, decompose and regroup numbers.

LANGUAGE SUPPORT

The vocabulary related to decimals will be new for learners, so practise using it wherever possible. Insist that decimals are read correctly and learners understand their values, for example:

- 6.4 (read as six point four) means 6 ones and 4 tenths
- 6.40 (read as six point four zero) means 6 ones and 4 tenths and 0 hundredths
- 6.04 (read as six point zero four) means 6 ones and 0 tenths and 4 hundredths.

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

Compose: put together, for example, $600 + 30 + 2$ is 632.
 Decimal: a number written in decimal notation, for example 34.5
 Decimal place: the position of a digit to the right of the decimal point in a decimal number. The number 45.67 has two decimal places
 Decimal point: the decimal point separates whole numbers from decimal places. You read 57.08 as 'fifty-seven point zero eight'.

T	O	t	h
5	7	0	8

Decompose: break down a number into parts, for example 456 is $400 + 50 + 6$
 Hundredth: one part in one hundred equal parts; as a decimal it is written as 0.01

1 THE NUMBER SYSTEM

CONTINUED

Place value: the value of a digit determined by its position. For example, in 830 the 3 has a value of 3 tens (30)

H	T	O
8	3	0

Regroup: to change the way a number is written. For example, $456 = 400 + 50 + 6$, but you can change this to $400 + 40 + 10 + 6$
 Tenth: one part in ten equal parts. As a decimal it is written as 0.1

Common misconceptions

Misconception	How to identify	How to overcome
Learners may consider hundredths to be greater than tenths.	Through discussion and in written work.	Ensure that place value charts are used as visual prompts.
Learners may misunderstand the concept that multiplying or dividing by 10, 100 or 1000 moves the digits of a number 1, 2 or 3 places to the left or the right.	Through discussion and in written work.	Make sure learners understand that when a digit is moved to the left its value increases (ones become tens and so on) and when it is moved to the right its value decreases. When working with whole numbers, do not condone the use of a 'rule' involving 'add a zero' as this causes difficulties when working with decimal numbers and fractions. Calculators are a useful teaching resource to demonstrate patterns when multiplying and dividing by 10 and 100, as shown in the Multiplying and dividing whole numbers by 10, 100 and 1000 main teaching idea (in the Additional teaching ideas for this section).

Starter idea

Getting started (20 minutes)
Resources: Unit 1 Getting started exercise in the Learner's Book.
Description: Give learners 10 minutes to answer the Getting started questions in their exercise books. 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 to review this prior knowledge.

Main teaching idea

Place value (20–30 minutes)
Learning intention: Understand and explain the value of each digit in decimals (tenths and hundredths).
Resources: Resource sheet 1B.

MATHEMATICS Teacher's resource

Detailed main lesson activity ideas are presented. There is one main lesson activity in print and two alternative or supplementary ideas that teach the same skill in a different way in the bundled digital access

CAMBRIDGE PRIMARY MATHEMATICS 5: TEACHER'S RESOURCE

Description: Show a place-value chart. Tell the learners that it is like the one they used in Stage 4 but it has been extended to include decimal numbers.

100	200	300	400	500
10	20	30	40	50
1	2	3	4	5
0.1	0.2	0.3	0.4	0.5
0.01	0.02	0.03	0.04	0.05

Place numbers (up to 2 d.p.) on the grid and ask learners to say the numbers. Then reverse the process: say numbers (up to 2 d.p.) and ask learners to place the numbers on the grid.

Shade cells in the displayed chart to make numbers with 2 decimal places, for example shade 6, 0.5 and 0.01 to make 6.51.

6	0	5	0	1
---	---	---	---	---

Ask learners to describe the grid.

Answer: 100 to 900 going across. Divide by 10 each time you move down a row.

Point to 0.4 and ask:

- How do you say this number?
- What is ten times this number?

Answer: zero point four, four

Point to 0.04 and ask "How do you say this number?"

Answer: zero point zero four

Repeat for other decimals, emphasising the language. Show a partly labelled place value grid and ask "What are the titles of the columns marked with a question mark?"

Answer: tenths, hundredths

H	T	O	?	?

Place numbers (up to 2 d.p.) on the grid and ask learners to say the numbers. Then reverse the process: say numbers (up to 2 d.p.) and ask learners to place the numbers on the grid.

Shade cells in the displayed chart to make numbers with 2 decimal places, for example shade 6, 0.5 and 0.01 to make 6.51.

H	T	O	?	?

Ask learners to work in pairs on the activity in Resource sheet 1B. Make sure they say the numbers as instructed.

1 THE NUMBER SYSTEM

Now ask learners to complete questions 1 to 4 of Exercise 1.1 in the Learner's Book.

Differentiation ideas: Support less confident learners by pairing them with a more confident learner who is willing to help them. Ask more confident learners to make sets of three cards offering different ways of decomposing and regrouping decimals, for example:

5.39 $5 + 0.3 + 0.09$ $4 + 1.3 + 0.09$

Plenary idea

Target board (10 minutes)

Resources: Copy of target board.

Description: Display the target board and ask questions related to it, for example:

- Which number is the result of dividing 409 by 100?

Answer: 4.09

- What is 18 divided by 10?

Answer: 1.8

3.06	2.13	5	3.45	5.18
3.34	3.24	3.3	2.5	4
3	3.1	1.69	3.29	4.79
4.09	3.5	4.9	2	1.8

Insist that learners say the decimals correctly (e.g. 3.06 is 'three point zero six').

Guidance on selected Thinking and Working Mathematically questions

Learner's Book Exercise 1.1, question 9

Learners are given four statements, each with a missing number, and have to work out which is the odd one out. You may need to remind learners that they need to calculate and then compare the missing numbers in order to identify the odd one out.

CROSS-CURRICULAR LINKS

Work on the history of measurement will include reference to the metric system. The metric system is an internationally recognised decimalised system of measurement, for example lengths can be measured in millimetres (mm) and centimetres (cm). There are 10mm in a cm so $1.4\text{cm} = 14\text{mm}$.

Learners will use metric measurements in science, for example when working on evaporation they may measure air temperatures in Celsius and the depth of water in a pond in millimetres or centimetres, and understand that $10\text{mm} = 1\text{cm}$.

Homework ideas

- Learners design a poster that shows how to multiply and divide by 10, 100 and 1000. They can illustrate it with examples, including drawings, pictures or photographs. For example:
 - 1 metre is 100 times as long as 1 centimetre
 - 1 cent is 100 times smaller than 1 dollar.
- Learners write questions and answers based on the target board used in the Target board plenary idea.

Clear homework ideas



Guidance on one Thinking and Working Mathematically question in each exercise is given



Teaching ideas specifically end by directing teacher to the exercise or specific questions

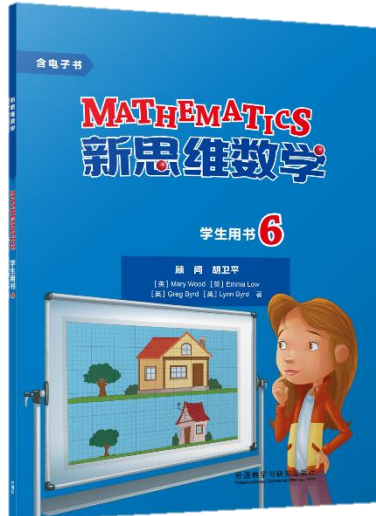


Science & Mathematics

Teaching plan



2~3 class hours per week



3~4 class hours per week



Science & Mathematics

Supporting system

National seminar

Regional seminar

scientific research

Joint teaching and research

Instructions

Inter-school exchanges

Teacher training

Personalized cooperation

Science & Mathematics

Publication time

	Science	Mathematics	Time
Learner's books	9 stages	9 stages	2022.08
Workbooks	9 stages	9 stages	2022.08
Teacher's resource books	9 stages	9 stages	2023.07



Free trial

