



Cambridge IGCSE™ Physics Chemistry Biology



Cambridge IGCSE™ Computer Science Brochure



Cambridge IGCSE™ Information & Communication Technology Brochure



Cambridge IGCSE™ English as a Second Language Brochure



Cambridge IGCSE™ Mathematics Core and Extended and Cambridge IGCSE™ & O Level Additional Mathematics



Cambridge Lower Secondary Mathematics

BROCHURE

Beyond Basics,
Reimagine Education

BROCHURE

Beyond Basics,
Reimagine Education

We are working with Cambridge Assessment International
Education towards endorsement of this series.



Cambridge IGCSE™ Physics Chemistry Biology

**Beyond Basics,
Reimagine Education**

Marshall Cavendish Education Cambridge IGCSE™ Physics, Chemistry and Biology are comprehensive two-year programmes designed to support learners with their study of the Cambridge IGCSE and IGCSE (9-1) Physics (0625/0972), Chemistry (0620/0971) and Biology (0610/0970) syllabuses.

Developed based on robust research, these series bring Science learning to life by focusing on real-life examples to which learners can relate. They are designed to excite and engage learners to be curious about scientific concepts, and to promote a deep understanding of topics. This is done by giving learners plenty of opportunities to practise learnt skills, reflect on concepts and share, discuss or journal what they have learnt.

Each series consists of both print and digital learning resources that support blended learning. This provides learners with a more complete and flexible learning experience.

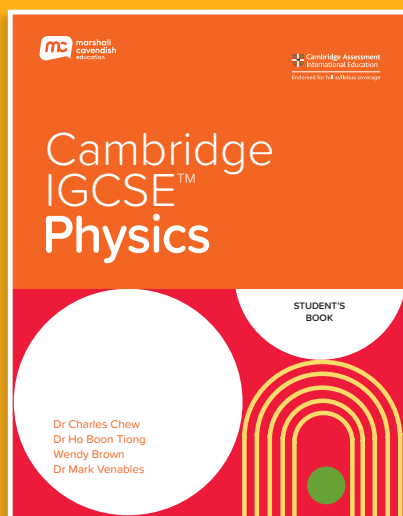
Recognising that there is a potentially diverse student population whose first language is not English, these series use simple and clear language with plenty of visual representations and also feature a mix of cultural examples for the international audience.

They also cater to learners at various levels of learning readiness by providing additional support and enrichment resources. Overall, these series will provide learners with scientific skills and knowledge for success, and nurture them into confident critical thinkers who are ready for the future.

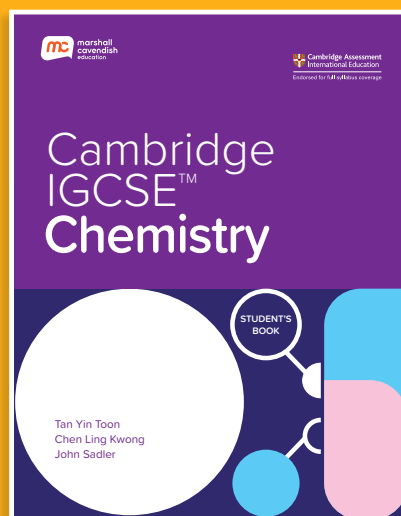
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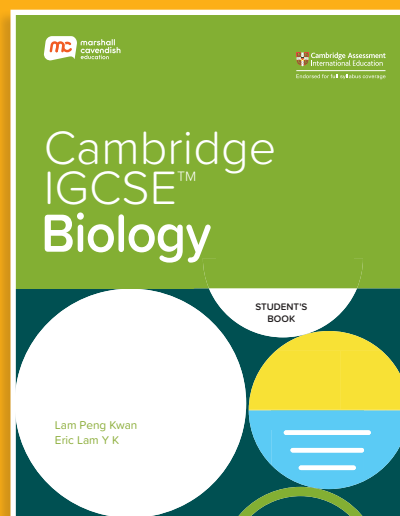
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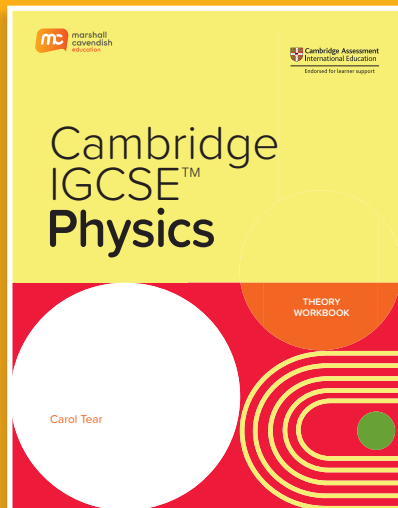


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Theory Workbook

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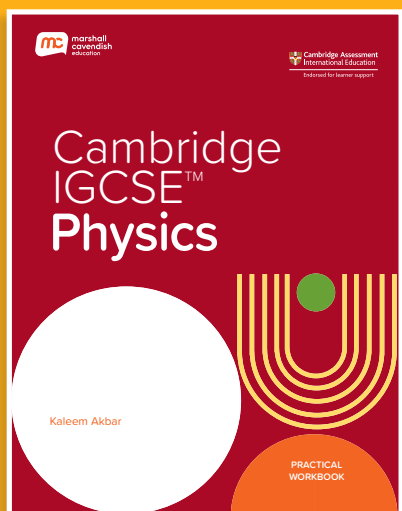


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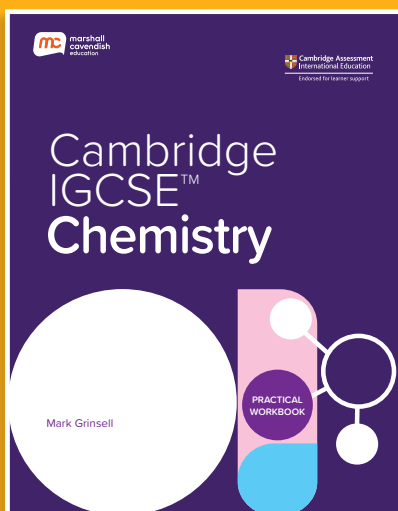


Practical Workbook

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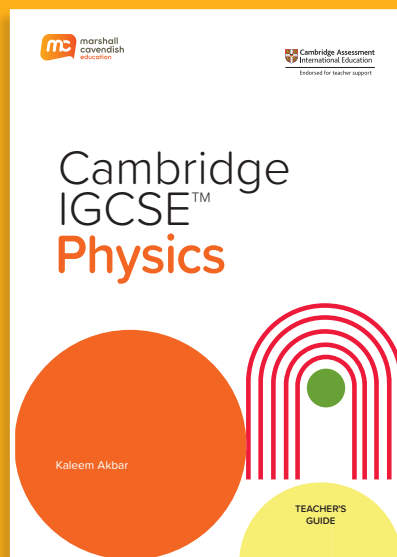


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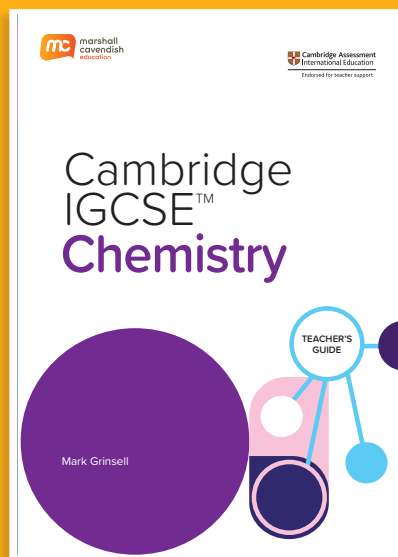


Teacher's Guide

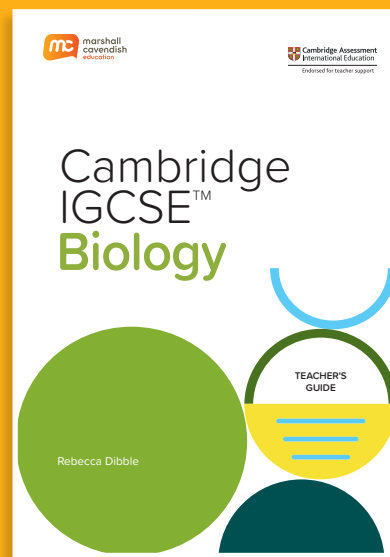
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Additional Digital Resources*

- Enhanced eBooks
- Full Solutions for Student's Book and Workbooks
- Printable Mind Maps
- Editable Resources:
 - Scheme of Work
 - Lesson Plans
 - Question Bank
 - PowerPoint Slides

**These resources will not go through the Cambridge International endorsement process.*



Why
choose

MCE Cambridge
IGCSE™ Physics,
Chemistry and Biology

1 Reduce Learning Obstacles and Achieve Proficiency in Concepts

2 Build Learners' Confidence and Exam-Readiness

3 Prepare Learners for the Future with 21st Century Competencies

4 Promote Global Awareness with International Context

5 Enhance Teaching and Learning Effectiveness with Digital Resources

Developed based on robust research to cater to learners of different learning readiness, these series will guide and support learners to overcome learning obstacles and foster a deeper understanding of concepts. With its clear and simple language, these series are designed to promote better understanding among international learners whose first language is not English. With the series' engaging content that enriches and enhances learning, learners will learn to appreciate the relevance of Science in their lives.

Visually Engaging Chapter Opener

Creates interest in the topic through real-life examples and thought-provoking questions.

CHAPTER

5

Enzymes



Watch Feature

Engages learners by using relatable examples demonstrated through videos, animations and interactives such as simulations and quizzes.



Scan this page to watch a clip on how the enzymes in washing powders work. Before watching, discuss what you expect to see or hear.



- What do you think the enzymes in the washing powders do to the stains on the T-shirt?
- Do you think these enzymes can do the same job in boiling water? Can you explain your reasoning?
- Do you think enzymes are living things?

Real-life Examples

Coupled with rich visuals and information, they help to promote the relevance of concepts.

Isn't it amazing how the toughest stains can be removed from your favourite T-shirts after washing? It is not done with the aid of special powders. It is through "special powders". A lot of washing powders available in the market contain biological catalysts called enzymes. What are enzymes?

72

Biology Student's Book

Questions

Assist educators to assess learners' prior knowledge by asking interesting questions on the topic.

Watch Feature

Presents information in different ways to promote understanding of concepts and offer real-life relevance.

Using MCE Cambridge IGCSE™ mobile application, learners can scan the physical page and view the resources on their mobile devices. Learners can also click and access the Watch feature from the eBooks on MCEduhub and the MCE Cambridge IGCSE mobile application.

Available in Chapter Openers and within some chapters.

Visual correction for short-sightedness

A person is short-sighted when his or her eyeball is longer than normal along the horizontal axis from the lens to the retina. The eye can still focus on near objects, but parallel light rays from distant objects are focused in front of the retina, forming a blurred image (Figure 12.58).

Short-sightedness can be corrected by wearing spectacles with concave lenses to diverge the rays from distant objects before they reach the eye. The diverged rays can then be focused onto the retina and this will enable the person to see distant objects clearly (Figure 12.59).

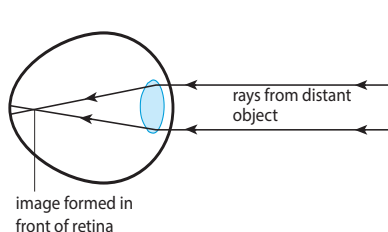


Figure 12.58 Short-sightedness — image forms in front of the retina

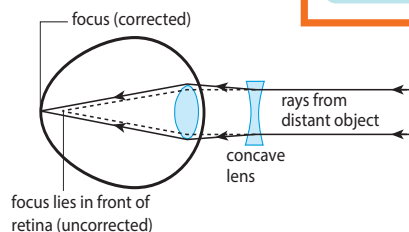


Figure 12.59 Correcting short-sightedness with a concave lens

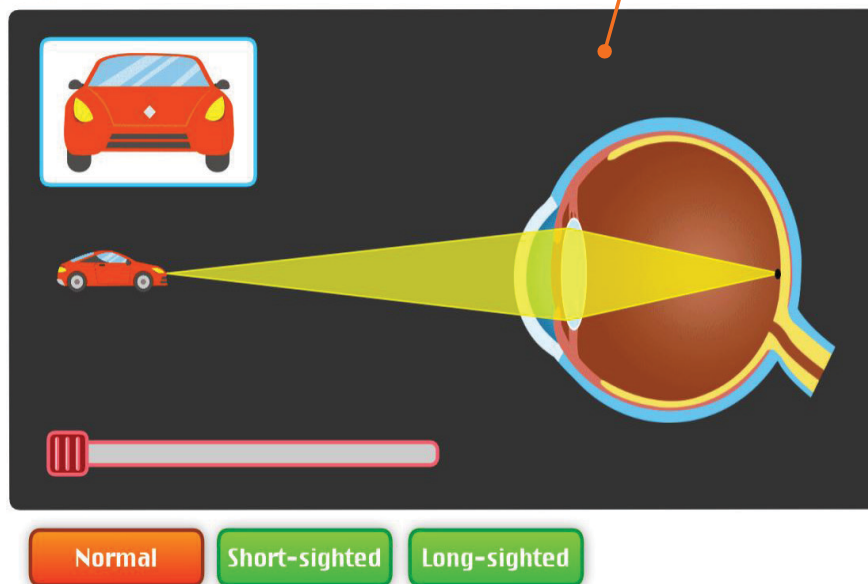


PHYSICS WATCH

Scan this page to explore a simulation on short sight and long sight.

Physics Student's Book

Simulation 10.1 Short Sight and Long Sight



mc marshall cavendish education

Learning Aims

Identify areas of focus and serve as a checklist for learners.

Enrichment (Info)

Provides interesting nuggets of information that help learners connect with real-life examples and deepen understanding.

Chapter 1

ENRICHMENT INFO

Other States of Matter

Besides solids, liquids and gases, there are two other states of matter — plasma and the Bose–Einstein condensate. Plasma is made of particles that are electrically charged. A Bose–Einstein condensate is a state of matter that has been cooled to a very low temperature.

QUICK CHECK

Gases do not have mass. True or false?



Quick Check

A timely checkpoint for learners to assess their understanding of concepts.

Headings and Subheadings

Phrased as questions to encourage curiosity and scientific inquiry in learners.

WORD ALERT (A-Z)

Compressed: squeezed into a smaller space.

2

States of Matter

Chemistry Student's Book

1.1 States of Matter

In this section, you will learn the following:

- State the properties of solids, liquids and gases.

Matter is a substance that has mass and occupies space. All living and non-living things are matter. Matter can exist as a solid, a liquid or a gas. These three forms of matter are called the states of matter. The three states of matter have very different properties (Table 1.1).

Table 1.1 Properties of solids, liquids and gases

Property	Solid	Liquid	Gas
Shape	Fixed	Not fixed	Not fixed
Volume	Fixed	Fixed	Not fixed
Compressibility	Cannot be compressed	Cannot be compressed	Can be compressed

Substances can exist in different states of matter under different temperature and pressure conditions. Changes in temperature and pressure can change the states of matter. For example, on freezing, water becomes ice; on boiling, water becomes steam. We will learn more about the changes of state of matter in Section 1.3.

1.2 Kinetic Particle Theory

In this section, you will learn the following:

- Describe the structures of solids, liquids and gases.

The differences in the properties of the states of matter can be explained based on the kinetic particle theory. The **kinetic particle theory** states that all matter is made up of *tiny particles* that are in *constant random motion*.

The word 'kinetic' refers to motion. Moving particles have kinetic energy, hence the name 'kinetic particle theory'. The kinetic particle theory

- describes the states of matter;
- explains the differences in the properties of solids, liquids and gases;
- explains the changes of state of matter.

Why does a solid have a fixed shape?

- According to the kinetic particle theory, the particles of a solid
- are closely packed in an orderly manner (Figure 1.1);
 - are held together by very strong forces of attraction;
 - have enough kinetic energy to vibrate and rotate about their fixed positions only;
 - cannot move about freely.

Hence, a solid has a fixed shape.

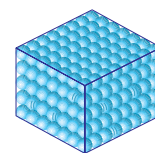


Figure 1.1 Particles are closely packed together in a solid.

Why does a solid have a fixed volume?

A solid cannot be **compressed** since its particles are already very close to one another. Thus, a solid has a fixed volume.

Word Alert

Provides information on words or explains difficult words in a simpler way for better understanding of content.

Content is presented in highly visual and bite-sized chunks to guide learners' thinking process and enable them to understand difficult concepts.

Chapter 5

Enrichment (Think)

Poses challenging questions to prompt higher-level critical thinking.

ENRICHMENT THINK

At low temperatures, enzymes are inactive but not destroyed.

- 1 Why do we place meat in the freezer?
- 2 Why does meat need to be cooked as soon as it is thawed?

ENRICHMENT THINK

Do you think denaturation is a reversible process?

Link

Builds relationships between information in earlier and later chapters, or directs learners to the relevant pages in Theory Workbook or Practical Workbook.

LINK

Practical 5A, pp. 39–41

Helpful Notes

Useful bite-sized notes and study tips for learners.

HELPFUL NOTES

The reciprocal of time ($\frac{1}{T}$) means $\frac{1}{T}$.

For example:

Time (sec)	10	20	30
$\frac{1}{T}$	0.1	0.2	0.3

Denaturation is the change in the three-dimensional structure of an enzyme or any other soluble protein, caused by heat or chemicals such as acids or alkalis.

Denaturation results in the loss or alteration of the enzyme's active site (Figure 5.8). The substrate can no longer fit into the enzyme's active site, and no reaction will occur. Hence, when an enzyme is denatured, it can no longer act as a catalyst.

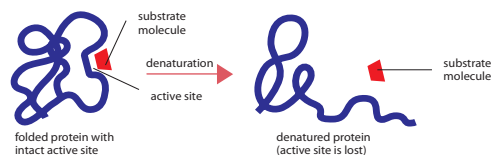


Figure 5.8 At temperatures above 45°C, some enzymes are denatured. Enzymes lose their active sites when they are denatured.

Let's Investigate 5A

Objective

To investigate how temperature affects enzyme action

Procedure

- 1 Label and fill test tubes A₁, B₁, C₁ and D₁ with 5 cm³ of starch solution respectively.
- 2 Label and fill test tube D₂ with 3 cm³ of distilled water, and test tubes A₂, B₂ and C₂ with 3 cm³ of diastase solution respectively.
- 3 Set up the experiment as shown in Figure 5.9 by placing the test tubes into water baths of varying temperatures:
 - A₁, A₂: 0°C
 - B₁, B₂: 37.0°C
 - C₁, C₂: 100.0°C
 - D₁, D₂: 37.0°C
- 4 Pour the contents of test tubes A₂, B₂, C₂ and D₂ into test tubes A₁, B₁, C₁ and D₁, respectively.
- 5 Test the solution in each test tube (A₁, B₁, C₁ and D₁) for the presence of starch using iodine solution.
- 6 Observe and record your results.

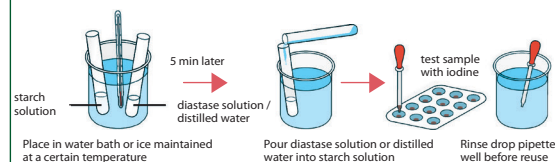


Figure 5.9 Experimental set-up to show how temperature affects enzyme activity

Discussion

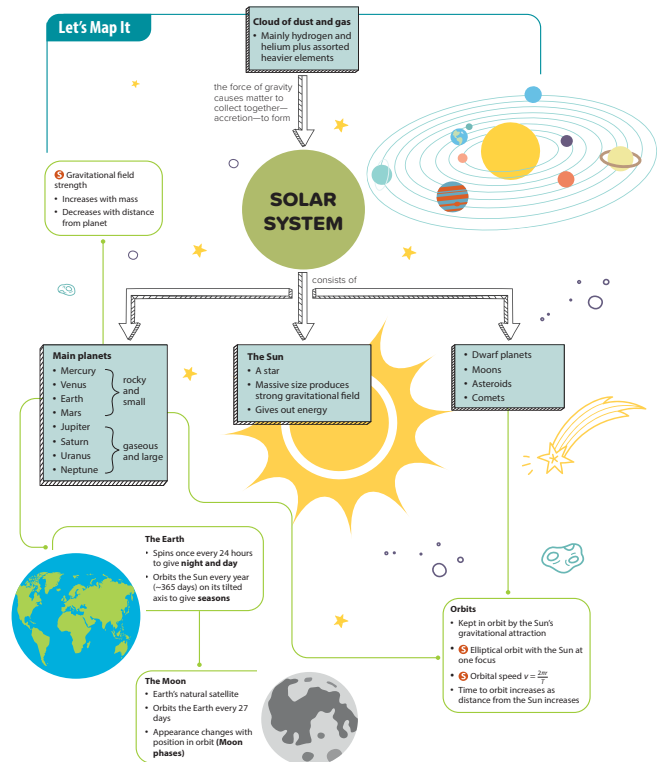
The less time taken to digest starch, the more active the enzyme is. In this investigation, enzyme activity is measured by calculating $\frac{1}{T}$ (the reciprocal of the time taken to digest starch). What can you conclude about the effect of temperature on the activity of diastase from the graph of $\frac{1}{T}$ against temperature?

Chapter 21

Enzymes

Biology Student's Book

Let's Map It



Earth and the Solar System

375

Physics Student's Book

Let's Map It

A visual tool to help learners understand the relationship between concepts and consolidate information covered in the chapter.

Designed to build learners' confidence and exam-readiness, these series are accompanied by ample assessment opportunities to enhance and reinforce learning. Learners are guided to transfer and apply their scientific knowledge to various contexts that can hone their process, practical, and problem-solving skills.

Let's Investigate

Practical investigations that introduce experimental methods and show how concepts are formed and tested, allowing learners to grasp concepts easily.

Chapter 5

ENRICHMENT THINK

At low temperatures, enzymes are inactive but not destroyed.
1. Why do we place meat in the freezer?
2. Why does meat need to be cooked as soon as it is thawed?

ENRICHMENT THINK

Do you think denaturation is a reversible process?

Denaturation is the change in the three-dimensional structure of an enzyme or any other soluble protein, caused by heat or chemicals such as acids or alkalis.

Denaturation results in the loss or alteration of the enzyme's active site (Figure 5.8). The substrate can no longer fit into the enzyme's active site, and no reaction will occur. Hence, when an enzyme is denatured, it can no longer act as a catalyst.

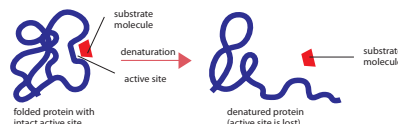


Figure 5.8 At temperatures above 45°C, some enzymes are denatured. Enzymes lose their active sites when they are denatured.

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Objective

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5. Test the solution in each test tube (A₂, B₂, C₂ and D₂) for the presence of starch using iodine solution.
6. Observe and record your results.

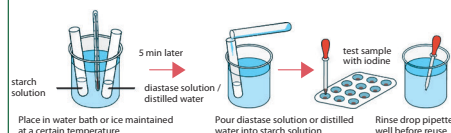


Figure 5.9 Experimental set-up to show how temperature affects enzyme activity

Discussion

The less time taken to digest starch, the more active the enzyme is. In this investigation, enzyme activity is measured by calculating $\frac{1}{t}$ (the reciprocal of the time taken to digest starch). What can you conclude about the effect of temperature on the activity of diastase from the graph of $\frac{1}{t}$ against temperature?

Chapter 1

Worked Example 1A

mercury oil water vapour common salt

At 20°C, which of the substances above

- (a) does not have a fixed shape and volume, and can be compressed;
(b) contains the most orderly arrangement of particles?

Solution

- (a) Water vapour
(b) Common salt

Let's Practise 1.1 and 1.2

1. State whether each of the following substances is a solid, a liquid or a gas at room temperature.
(a) Air (b) Carbon dioxide (c) Coal (d) Cooking oil
(e) Oxygen (f) Petrol (g) Rock (h) Steel (i) Water
2. (a) In which state of matter can the particles move most freely?
(b) In which state of matter are the particles closest together?
3. **Mind Map** Construct your own mind map for the concepts that you have learnt in these sections.

1.3 Changes of State of Matter and the Kinetic Particle Theory

In this section, you will learn the following:

- Describe changes of state in terms of melting, boiling, evaporating, freezing and condensing.
- Explain changes of state in terms of the kinetic particle theory.

What are the changes of state?

Have you ever wondered why water droplets form on a cold surface and why water changes to ice in a freezer? These changes happen due to a change of state of water.

Matter can change from one state to another when it is heated or cooled. When you lick a popsicle, it changes from a solid to a liquid. Heat from your tongue is transferred to the popsicle, causing it to melt. Changes of state are **reversible** (Figure 1.5). There is no gain or loss of matter when there is a change of state.



Figure 1.5 Changes of state of water

Worked Examples

Demonstrate how to answer questions or work out a problem to guide learners in the application of knowledge.

Let's Practise

Practices that allow for an assessment of how well learners have understood the section.

Let's Review

- 9 In the potential divider in Figure 17.54, the variable resistor R has a maximum resistance of $4\ \Omega$. What are the minimum and maximum possible values of V_{out} ?

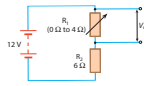


Figure 17.54

	Minimum V_{out}/V	Maximum V_{out}/V
A	0	4.8
B	0	6
C	2	4.8
D	6	12

- 10 The circuit in Figure 17.55 is used to detect the level of sunlight. The resistance of the LDR is $1\text{ M}\Omega$ in the dark and $100\ \Omega$ in bright sunlight. What is the voltmeter reading in dark and bright conditions?

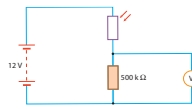


Figure 17.55

	Voltmeter reading in the dark/V	Voltmeter reading in bright sunlight/V
A	4	9
B	4	12
C	9	0
D	9	4

- 11 Figure 17.56 shows a thermistor connected in a potential divider circuit at room temperature. The resistance of this thermistor decreases with an increase in its temperature. Which of the following happens to the voltmeter reading when the

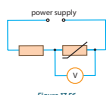


Figure 17.56

- A Decreases
B Decreases and then increases
C Increases
D Stays the same

Section B: Short-answer and Structured Questions

- 1 For the circuit in Figure 17.57, calculate the
(a) combined resistance across AB;
(b) combined resistance across CD;
(c) combined resistance of the whole circuit;
(d) current flowing through the $6\ \Omega$ resistor.

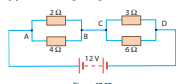
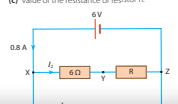


Figure 17.57

- 2 A 6 V cell is connected to three resistors in the circuit shown in Figure 17.58. The current flowing through the source is 0.8 A . Calculate the
(a) current I_1 ;
(b) current I_2 ;
(c) value of the resistance of resistor R .



CHAPTER 1

Measurement of Physical Quantities

Exercise 1A

Physical Quantities

- 1 Find and circle **four** base physical quantities and their SI units in the puzzle. Write them in the table, in the correct spaces to match the symbol for the unit.

M K I L O G R A M T
A M P E R E E K N U
S E J N X M F E I P
S T N G I Z R W U G
B R Y T H R H V J M
K E L H U T F C S L
Q S E C O N D R E M

Base quantity	SI unit	Symbol for SI unit
		m
		kg
		s
		A

- 2 Complete the sentences to give the measurements using the prefixes.

- (a) A cube has sides that measure 0.15 m . This is _____ cm.
(b) A current of 0.03 A is the same as a current of _____ mA.
(c) A mass of 0.15 kg is the same as a mass of _____ g.
(d) An athlete runs 100 m in a time of 9870 ms . This is the same as running a distance of _____ km in a time of _____ s.

_____ is the same as _____ cm.
_____ kW of power. This is _____ MW.

_____ is the same as _____ m.
_____ 000 000 54 m

Measurement of Physical Quantities

Physics Theory Workbook

Exercises

Selected formative questions with language support formats such as word search that help build up learners' vocabulary.

Exam-style Questions

Past paper questions or exam-style questions which provide exposure to different question types to build exam-readiness in learners.

Let's Review

Exam-style questions at the end of a chapter that act as a form of summative assessment and aim to create confidence in learners that they have mastered the topic.

Let's Reflect

Allows learners to review and reflect on their learning, which helps to identify gaps in learning that they can work on.

Chapter 1

Exercise 1E

Let's Reflect

Reflect on your learning achievements for each section in Chapter 1. Look back at the concepts taught in the Student's Book. Check how you fare in answering the questions in the Student's Book and the Theory Workbook. Then complete the Chapter Journal.

- 1 Rate your confidence level for your understanding of this chapter. Draw a pointer on the confidence meter to show your confidence level.
→ If you are not confident or only somewhat confident, go back to the Student's Book and revise this chapter.



- 2 What questions do you still have about the concepts taught in this chapter? Write them, if any, in the space provided.

1.1 Physical Quantities

1.2 Scalars and Vectors

→ If you have written any questions, show them to someone such as your teacher who can help you.

- 3 What other thoughts do you have about learning this chapter?

Chapter 1

Exercise 1E

Exam-style Questions

- 1 A liquid has a fixed volume and takes the shape of a container. A gas does not have a fixed volume and takes the shape of a container. Use the kinetic particle theory to explain these observations.

_____ [3]

- 2 The diagram shows the heating curve of substance X.

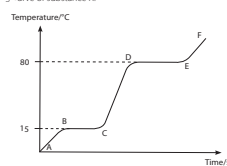


Figure 1.1

- (a) What is the melting point of substance X? _____ [1]
(b) Is substance X a solid, a liquid or a gas at room temperature (25°C)? _____ [1]
(c) Name the process taking place at part DE of the heating curve. _____ [1]
(d) Describe how the particles of substance X at parts CD and EF of the curve differ in their arrangement, amount of energy and motion.

_____ [3]

Practical Workbook

Practical experiments are structured to promote a deeper understanding of concepts and develop experimental skills and techniques.

Practical tips

Warn learners of potential hazards in the laboratory and help them develop good laboratory practices.

Experimental skills

Highlight the practical skills that learners will practise in the experiment.

Theory

Related background information and concepts are highlighted to introduce the experiment.

Chapter 1

Practical 1B

The Evaporation of Propanone

Skills

You will practise how to:

- follow a set of instructions to measure the temperature change over time as propanone evaporates;
- safely use a flammable liquid;
- measure temperature;
- consider the control of variables;
- plot a graph.

Theory:

Propanone is a liquid with a relatively low boiling point. The evaporation of a liquid absorbs energy.

Objective: To measure the temperature change when a liquid evaporates

Materials:

- thermometer
- cotton wool
- elastic band
- dropping pipette
- 1 cm³ propanone (flammable, moderate hazard)
- retort stand
- stopwatch

Procedure:

- ⚠ Put on safety goggles before you start the experiment.
Keep propanone away from naked flames.

- 1 Wrap some cotton wool around the bulb of a thermometer and use an elastic band to hold it in place.
- 2 Clamp the thermometer as shown in Figure 1.2.
- 3 Take 1 cm³ propanone in a dropping pipette and drip it onto the cotton wool.
- 4 Start the stopwatch and take the temperature. Record this value in Table 1.1.
- 5 Measure and record the temperature each minute for six minutes.

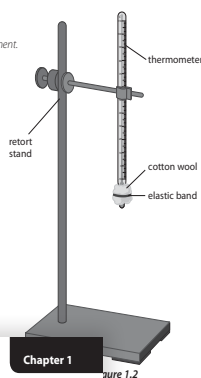


Figure 1.2

Observations:

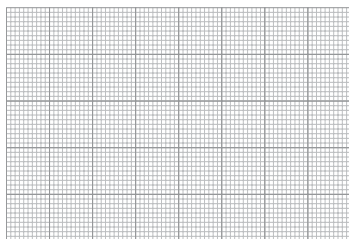
- 1 Record your results in Table 1.1.

Table 1.1

Time / minutes	0	1	2	3	4	5	6
Temperature / °C							

Analysis:

- 2 Plot a graph of temperature (on the y-axis) against time (on the x-axis).
Draw a smooth curve of best fit through the plotted points.



- 3 Estimate from your graph:

- (a) the minimum temperature reached _____
(b) the time taken to reach the minimum temperature _____

Conclusion:

- 4 Explain why the temperature at first went down.

Analysis and Conclusion

Guiding questions that encourage higher-order thinking that help learners interpret and evaluate results and draw conclusions.

Chapter 1

- 5 Explain why the temperature started to rise at the end of the experiment.

Evaluation:

- 6 Propanone is flammable and presents a moderate hazard to health. State the safety precautions you should take when using propanone.

- 7 (a) Why should scientists repeat experiments?

- (b) Explain what you would have to control if you wanted to repeat this experiment.

- 8 Plan an experiment to test how airflow affects the rate of evaporation of propanone.

⚠ This is a planning exercise but if the experiment is carried out, a full risk assessment will be required.

Evaluation

Questions that promote critical thinking by encouraging reflection on the experiments conducted and their rationale.

Chemistry Practical Workbook

States of Matter

5

Chemistry Practical
Workbook

Chemistry Practical
Workbook

Additional information and activities related to real-world contexts are present to promote engagement and encourage exploration. These series will help learners expand their knowledge, deepen their understanding and empower them with 21st century competencies essential for the future.

ENRICHMENT INFO

Do you know?

- 1 The length from your wrist to your elbow is the same as the length of your foot.
- 2 Your mouth produces 1 l of saliva a day.
- 3 Breathing generates about 0.6 g of carbon dioxide every minute.
- 4 On average, people can hold their breath for about one minute. The world record is 21 min 29 s.

ENRICHMENT THINK

At low temperatures, enzymes are inactive but not destroyed.

- 1 Why do we place meat in the freezer?
- 2 Why does meat need to be cooked as soon as it is thawed?

Enrichment

Additional information and activities that encourage further exploration of concepts and provide more context for learners.


ENRICHMENT ACTIVITY

Use the Internet to search for an animation of the kinetic particle model.

Physics, Biology, Chemistry Student's Book

STEAM Project (*Beyond syllabus)

Product Development in the Cosmetic Industry: The Bath Fizzer



The cosmetic industry makes and distributes cosmetic products. Cosmetics are substances applied on the face and the body to improve our appearance. Some examples of cosmetics are soaps, shampoos, moisturisers, perfumes, lipsticks and facial make-up. The United States of America is currently the world's largest cosmetic market, followed by China and Japan.

Skill — Designing a Product

How are new products in the cosmetic industry developed to suit the needs of the users? You may follow the simplified product development process used in the industry (Figure 1).

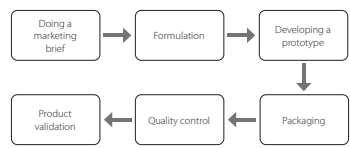


Figure 1 Simplified product development process




Figure 2 Bath fizzes have a variety of scents and come in various shapes and colours.

200

STEAM Project


Chemistry Theory Workbook

STEAM Projects

Project-based learning that features real-world situations which allow learners to develop 21st century skills while applying what they have learnt in the course.

Featuring a mix of cultural examples, these series aim to provide both an international view and a sense of familiarity in the learning journey. With more relatability in its content, learning becomes more meaningful for the international audience.

CHAPTER
11 **Oxidation and Reduction**



QUESTIONS

- Describe the age of the Statue of Liberty.
- How can we tell the Statue of Liberty is old?
- The green color is due to a compound. What is it?
- What type of chemical reaction caused the change in color?







This picture shows the Statue of Liberty, a sculpture in New York, United States of America. The Statue of Liberty is made of copper sheets stretched over and riveted onto a steel structure. The Statue of Liberty was originally dull brown. However, as you can see, the Statue is now green. What type of chemical reaction caused the change in colour?

Chemistry Student's Book

How do we construct and use a dichotomous key to identify organisms?

A **dichotomous key** is used to identify and classify organisms. A dichotomous key has a series of paired statements called couplets. Each couplet consists of two contrasting statements. We work through the series of paired statements by choosing the one that matches the organism in each step, until the organism is identified.

Table 1.3 shows a dichotomous key used to identify the vertebrates in Figure 1.21.

		
Pigeon	Frog	Leopard cat
		
Water monitor	Tilapia	Goat

Biology Student's Book

A force can change the size and shape of dough.



Physics Student's Book

These series are developed with flexibility and convenience in mind to support both new and experienced educators in delivering quality and engaging lessons. The accompanying online digital resources can be used to facilitate real-time learning through online lessons. Learners can enhance their comprehension at their own pace by revisiting the resources on their own.

Scheme of Work* (Editable)

Includes suggested time frame, learning objectives and materials involved to help educators plan and deliver lessons effectively.

**This resource will not go through the Cambridge International endorsement process.*

Scheme of Work: Chapter 2 Organisation of the Organism

(The following content has not been through the Cambridge Assessment International Education endorsement process.)

Context: This chapter explores how the cell operates as an individual structure before reviewing its role in the tissue, organ and organism. Students need to gain an appreciation of how the different organelles contribute towards the overall running of the cell and thus, and how different proportions of each organelle are needed in different specialised cells. This chapter also reviews the use of microscopes and how calculations of size can be made using information from microscope images. It is vital for students to appreciate the role of microscopes in allowing us to review the cell and its operations while also retaining a sense of size.

Term / Week	Learning objectives	Lesson number (No. of periods)	Suggested teaching activities using the Student's Book	Theory Workbook	Practical Workbook
TERM 1 Week 2	<p>2.1.1 Describe and compare the structure of a plant cell with an animal cell, limited to: cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, ribosomes, mitochondria, vacuoles</p> <p>2.1.4 Describe the functions of the structures listed in 2.1.1 and 2.1.2 in plant, animal and bacterial cells</p>	Lesson 1 (1 period)	<p>Chapter 2, p. 18</p> <ul style="list-style-type: none"> Bio Watch and questions <p>2.1 Cell Structure, pp. 19–25</p> <ul style="list-style-type: none"> Explain the use of microscopes as a tool to help us review cells. Discuss the cell as a factory with different parts of the cell having to do different roles to make it function. <p><i>Link [Backward]</i></p> <ul style="list-style-type: none"> Explore the different organelles and their role. <p><i>Helpful Notes, Link [Forward], *Enrichment [Info], Quick Check</i></p> <ul style="list-style-type: none"> Create a summary table of the similarities and differences between plant and animal cells. 		

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1

Biology Scheme of Work

Learning Objectives

Codes are taken from the syllabus which can be used for easy reference.

Lesson Plans* (Editable)

Assist educators to structure and organise the lesson plan for most effective learning.

**This resource will not go through the Cambridge International endorsement process.*

Differentiated Instruction

Suggested teaching ideas to support and engage learners who are at different readiness levels.

Warm-up

Teaching ideas to capture learners' interest in the new topic or review the previous lesson.

Ask

Suggested questions to facilitate discussion in class.

Suggested Answers

Facilitate the assessment of learners' understanding and boost educators' confidence in teaching.

Wrap-Up

Provides ideas for consolidation and evaluation at the end of a lesson.

Chemistry of the Environment

LESSON 4

Note: Have students read the Student Book, pp.26-29. (This can take place as a pre-lesson activity, done outside of curriculum time, a day or two ahead of the lesson.)

Warm-Up

- 1 Ask: Have you heard about the term global warming? What do you understand by this term? Is global warming something positive or negative?

Discuss briefly with students to see how much they are aware of global warming.

10.3 Air Quality and Climate (pp.26-27)

How does global warming lead to climate change? (pp.26-27)

- 2 Teach students about global warming.
- Explain how the Earth is overheating. State that activities such as burning of fossil fuels and large-scale deforestation are causing the build-up of carbon dioxide in the atmosphere.

Ask: What specific examples of human activities can you think of that involve the burning of fossil fuels, which contribute to the carbon dioxide build-up?

Answer: Examples may include the use of vehicles for transportation, production of goods in manufacturing and production of electricity in power stations.

- Define the term global warming for students.
- Explain the greenhouse effect. Refer students to Figure 10.1 on p.26.

AR (p.26)

21st Century Skills: ICT literacy

Show the AR clip on greenhouse effect by projecting on a screen or get students to watch the AR on their own mobile devices.

- 3 Go through the consequences of global warming in Figure 10.2 on p.27.
- Ask: Have you read about these consequences happening around the world in newspapers or heard about them from news broadcast? Which places in the world are or will likely be experiencing extreme climate change?

Answer: Students may cite examples from the current news. Places that will likely be affected badly by climate change include Mumbai in India and Gansu in China. Mumbai is a coastal city and may experience frequent flooding. Gansu, already one of the driest region in China, may experience extreme drought.

Enrichment (Think) (p.27)

21st Century Skills: critical thinking, communication

Ask: What other direct or indirect consequences of global warming can you think of?

Get students to discuss in groups and share their answers with the class.

Support less able students by giving simple examples to help them understand the difference between direct and indirect consequences.

Answer: Other consequences may include shortage of food, increased health issues, decreased land area and increased death.

- 4 Explain to students the purpose of the Kyoto Protocol.

Support less able students by showing them information in charts, graphs and infographics, e.g. annual carbon dioxide emissions by country, signatory countries on the world map, etc.

Challenge more able students to find out more about the more recent Paris Agreement and how it is different from the Kyoto Protocol.

Enrichment (Activity) (p.27)

Have a class debate on whether the Kyoto Protocol is a success or failure. Give students a week or two to do their research and prepare for this debate. Tell students to be ready for the class debate on the Kyoto Protocol to be conducted during another class period.

Wrap-Up

- 5 Summarise the main learning points of the lesson and Section 10.3. Write on the board using a concept map or graphic organiser. You may want to use the relevant part of Let's Map It on p. 30.

Let's Practise (p.27)

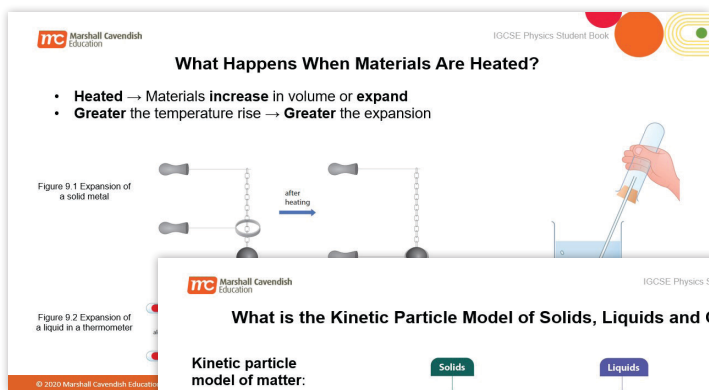
AO1: Knowledge with understanding

- Discuss the answers to the questions in the class or get students to do the questions as homework.

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Chemistry Teacher's Guide

Image shown is for illustration purpose only.



PowerPoint Slides* (Editable)

PowerPoint slides can be used for frontal or online teaching and help educators save time on lesson preparation, allowing for more interaction with the learners.

**This resource will not go through the Cambridge International endorsement process.*

Physics PowerPoint Slides

Question Bank* (Editable)

Provides extra practice for learners and includes higher-order thinking questions to prompt analysis and critical thinking. May be used to generate online quizzes for classroom engagement.

**This resource will not go through the Cambridge International endorsement process.*

Chapter 7 Electrochemistry

Question 1
When an experiment was set up as shown in Figure 7.1, the voltmeter showed a reading although there were no reactions occurring at the electrodes.

Figure 7.1

What is liquid X?

- Dilute aqueous sodium bromide
- Mercury
- Molten sodium bromide
- Oil

Question 2
When hydrogen is used as a fuel, it reacts with substance Y. What is Y?

- Carbon dioxide
- Helium
- Nitrogen
- Oxygen

Chemistry Question Bank

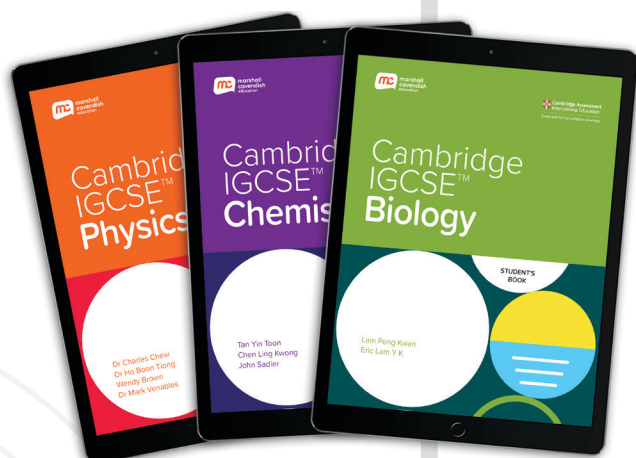


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Annotatable Enhanced eBooks*

Student's Book, Theory Workbook, Practical Workbook, Teacher's Guide

Suitable for online learning as learners can annotate and save their work on MCEduHub. Learning can take place in real time and in one's own time.

In addition, learners can easily access the Watch feature in the Student's Book.

**This resource will not go through the Cambridge International endorsement process.*

Physics

1. Measurements of Physical Quantities	12. Light
2. Motion	13. Electromagnetic Spectrum
3. Mass, Weight and Density	14. Sound
4. Forces	15. Simple Phenomena of Magnetism
5. Momentum	16. Electrical Quantities
6. Energy, Work and Power	17. Electric Circuits and Electrical Safety
7. Pressure	18. Electromagnetic Effects
8. Kinetic Particle Model of Matter	19. Nuclear Model of the Atom
9. Thermal Properties and Temperature	20. Radioactivity
10. Transfer of Thermal Energy	21. Earth and the Solar System
11. General Properties of Waves	22. Stars and the Universe

Chemistry

1. States of Matter	11. Oxidation and Reduction
2. Elements, Compounds and Mixtures	12. Acids, Bases and Salts
3. Atomic Structure	13. The Periodic Table
4. Ionic, Covalent and Metallic Bonding	14. Metals
5. Chemical Formulae and Equations	15. Chemistry of the Environment
6. The Mole	16. An Introduction to Organic Chemistry
7. Electrochemistry	17. Alkanes and Alkenes
8. Energy Changes	18. Alcohols and Carboxylic Acids
9. Rate of Reaction	19. Polymers
10. Reversible Reactions and Equilibrium	20. Experimental Techniques and Chemical Analysis

Biology

1. Characteristics and Classification of Living Organisms	12. Respiration
2. Organisation of the Organism	13. Excretion in Humans
3. Movement of Substances Into or Out of Cells	14. Coordination and Response
4. Biological Molecules	15. Hormones, Homeostasis and Tropic Responses
5. Enzymes	16. Reproduction in Plants
6. Plant Nutrition	17. Reproduction in Humans
7. Human Nutrition	18. Inheritance
8. Transport in Plants	19. Variation and Selection
9. Transport in Animals	20. Organisms and Their Environment
10. Diseases, Immunity and Drugs	21. Human Influences on Ecosystems
11. Gas Exchange in Humans	22. Biotechnology and Genetic Modification

You may also be interested in:

Cambridge Primary Science

Grade 1 – 6 | Age 7 – 12



Marshall Cavendish Education (MCE) Cambridge Primary Science (2nd Edition) is the latest edition of our Primary Science series that fulfils the new Cambridge Primary Science curriculum framework (0097). The series is specially created to help young learners build a sound understanding of scientific concepts and to become young scientists who make a difference to the world around them with their knowledge and skills.

Within this series, you will find Singapore's tried-and-tested methodologies embodied in high-quality resources that support the Cambridge Primary Science curriculum framework. This programme includes a range of supporting resources, customisable for both online and face-to-face learning, in order to consistently deliver outstanding learning and teaching experiences.

The 2nd edition has retained the active learning approach, easy-to-understand language, and rich visuals. It builds on the previous edition by incorporating the new Thinking and Working Scientifically strand in order to nurture active learners who understand the relevance of science to the world around them.

Scan here to learn more!



This series is endorsed by Cambridge Assessment International Education.



Grade 7 – 9 | Age 13 – 15



Science Ahead is a comprehensive three-level science programme based on Cambridge Lower Secondary Science curriculum framework (1113) for Stages 7, 8 and 9, while also drawing on other national syllabuses. The series uses the constructivist-inquiry approach to offer a learner-centred solution, helping learners acquire scientific concepts and skills. The curriculum content is structured using spiral progression, allowing learners to revisit concepts and skills at different stages with increasing depth, thus ensuring a strong foundation.

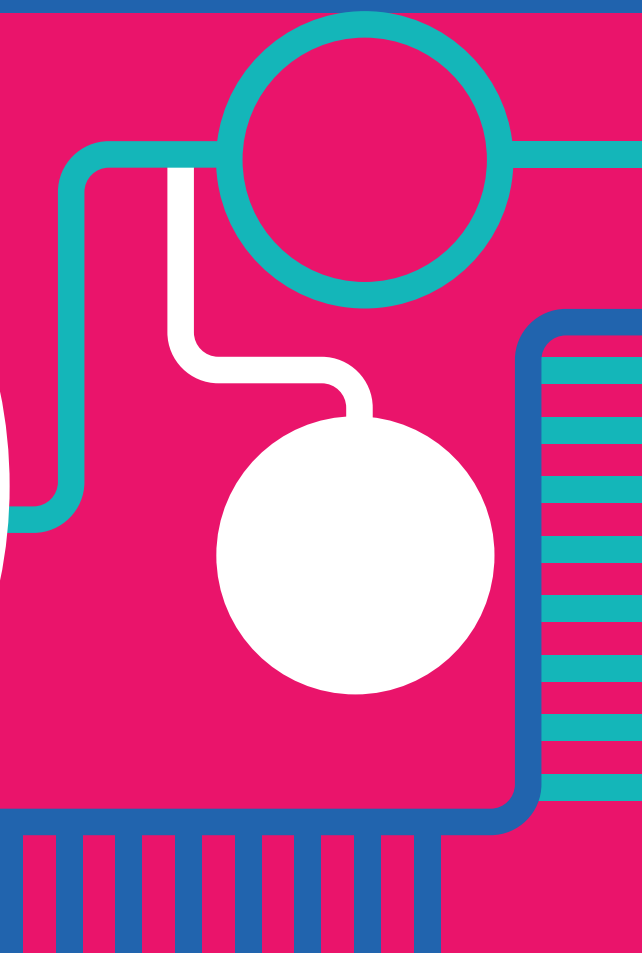
The series makes use of vibrant photographs, clear infographics, inquiry questions, activities and case studies to deliver an engaging and enjoyable science learning experience.

This series will not go through the Cambridge International endorsement process.



Cambridge IGCSE™ Computer Science Brochure

**Beyond Basics,
Reimagine Education**



Marshall Cavendish Education Cambridge IGCSE™ Computer Science is a comprehensive two-year programme designed to support learners with their study of the Cambridge IGCSE and IGCSE (9–1) Computer Science syllabuses (0478/0984).

This IGCSE Computer Science series encapsulates the Cambridge Approach into a suite of accessible and approachable learning materials that support blended learning.

It encourages active and inquiry-based learning which helps learners to develop 21st century skills. It is also designed to support learners for whom English is not their first language by using simple and concise language in its content.

Through the engaging chapter openers, colourful illustrations and infographics that convey bite-sized concepts, our series promotes visual learning and delivers an engaging learning experience. Overall, this series enables learners to develop necessary skills to embrace the rapidly changing technological landscape and become future problem solvers.

Why
choose

MCE Cambridge
IGCSE™
Computer Science

1 Reduce learning obstacles and achieve proficiency in concepts

2 Build learners' confidence by linking theory to real-life applications

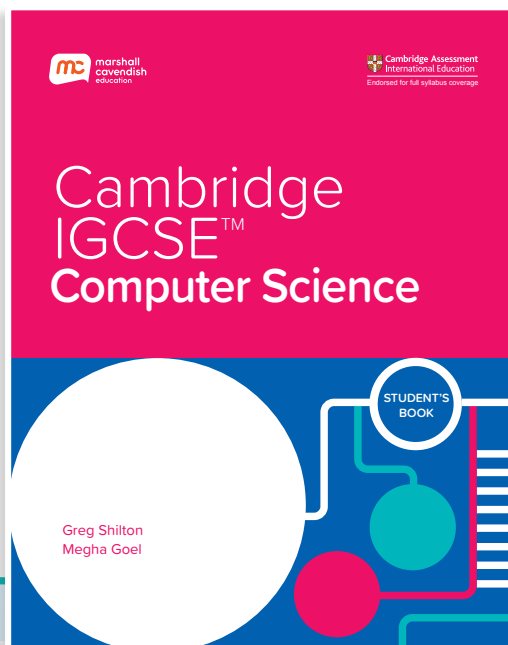
3 Prepare learners for the future by equipping them with 21st century competencies

4 Enhance teaching and learning effectiveness with digital resources

What's in Our Package?

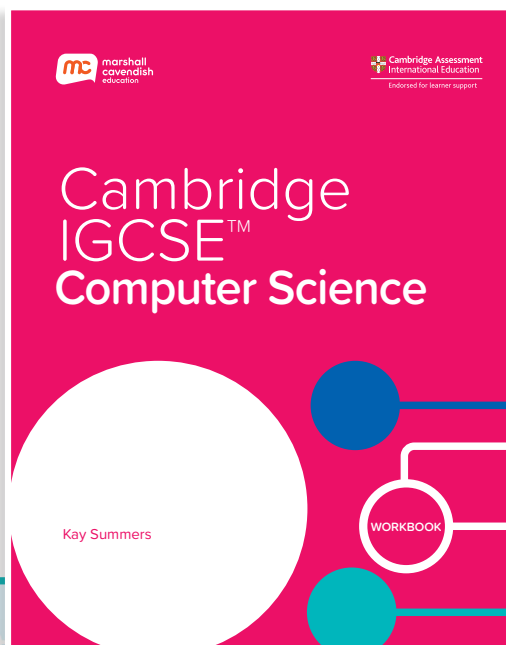
Student's Book

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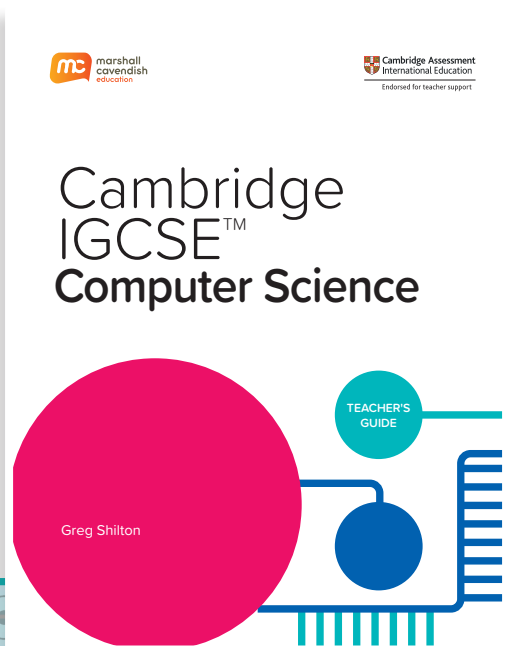
Workbook

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Teacher's Guide

ISBN 9789814941617



Additional Digital Resources

- Enhanced eBooks
 - Ability to annotate, save and submit work
- Digital Teacher's Guide
- Editable Resources:
 - Scheme of Work*
 - Lesson Plans
 - PowerPoint Slides*
 - Coding Instructions*

**These resources will not go through the Cambridge International endorsement process.*

With its **clear and simple language**, this series cater to learners for whom English may not be their first language. The **highly-visual** and **clearly-organised content** is also designed to guide learners of various learning readiness to master the syllabus. In addition, the use of technology helps to **enrich and enhance learning**.

CHAPTER 10

Logic gates and circuits

Watch Feature
with **videos and**
interactives to
engage learners
and promote
ease of learning.

Questions to trigger
learners to think about
how the topic relates
to their daily life.

QUESTIONS

- How could logic gates be used in everyday life?
- How are logic gates and micro controllers used in all computer systems such as games consoles?
- What are digital circuits in computer systems and how do they use binary values 1s and 0s?

To understand how to:

- Identify and use the standard symbols for logic gates
- Define the functions of logic gates
- Explain the functions of logic gates
- Use logic gates to create logic circuits from a given problem
- Complete truth tables from a given problem
- Write a logic expression from a given problem.

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Clear learning objectives are aligned to the syllabus. Provide a clear overview of what learners have to learn.

Visuals related to real-world examples of the topic.

Chapter 10

DEFINITION

Logic gates: the basic units of a digit circuit that control the flow of electronic signals.

Definition to explain key terms in each chapter to help learners to remember better.

WORD ALERT

Combination: a joining of different parts or qualities

Arithmetic: Use of numbers to calculate an outcome

Equivalent: The same equal meaning

HELPFUL NOTES

Be careful not to confuse the Boolean operator '+' with '+', which means 'plus' in normal math.

LINK

Consolidate your understanding by completing Exercise 1 in the Workbook.

Word Alert provides the commonly used vocabulary in the series.

7.1 Logic gates

Logic gates are the basic building units of any digital circuit. Today, these circuits are used in almost every computer system. From elevators, to washing machines, logic gates are used all around you.



▲ Digital circuit used to open electronic door.

This chapter will explore the types and function of common logic gates.

There are a number of different types of logic gate, with different logic rules. The **combination** of several logic gates forms a circuit, which allows for the design and performance in modern computers. The gates receive binary data, apply a Boolean operation, and then output a binary result.

Boolean operations

The word 'Boolean' comes from Boolean algebra, which is the basis of computer **arithmetic** and especially logic gates. There are only two Boolean values: True and False. They have **equivalents** in normal language and in binary notation.

Boolean expressions can compare data of any type as long as both parts of the expression have the same data. In computer science, Boolean expressions can be used in programming and produce Boolean values when evaluated. Boolean values are either true or false:

Boolean value	Binary value	Synonyms		
True	1	On	Yes	Positive
False	0	Off	No	Negative

There are also three logical operators: NOT, AND, and OR. The Boolean Operators for these are AND '&', OR '+', and NOT '~', which is written above the letter.

~A means NOT A

A & B means A AND B

A + B means A OR B

Logic gates, use both Boolean values and operators.

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Logic gates and circuits

Bite-sized information to guide learners in learning concepts better.

This series create opportunities for learners to **engage** in their learning, as they **make the connection** between the theory they learn in the classroom to real-world scenarios through the various worked examples and activities in the book.

Here is the truth table for the OR gate above:

Inputs		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	1

Logic notation: $X = A \text{ OR } B$

Boolean algebra: $X = A + B$

Out of the four possible output states, the only time output X will be 0 is when both the inputs A and B are 0.

Worked Example

A security light outside a house comes on after 6.00pm or if it is dark. Make a table showing the operation in normal language with corresponding Boolean and binary values. Make the resulting truth table and choose the logic gate that will make this happen.

Solution

We have to state the **conditions** under which the light will come on:
if it is after 6.00pm
if it is dark

Then we convert these into the Boolean values 'True' and 'False':
it is after 6.00pm = Yes/True/Positive
if it is dark = Yes/True/Positive

Next we add the binary values:

it is after 6.00pm	Yes	True	Positive	1
it is dark	Yes	True	Positive	1

Then we make the truth table. The inputs are 'it is after 6.00pm' and 'it is dark':

Inputs	
it is after 6.00pm	it is dark

The light coming on is the output:

Inputs		Output
it is after 6.00pm	it is dark	the light comes on

Remember that the light will come on if either of the conditions is true:

Inputs		Output
it is after 6.00pm	it is dark	the light comes on
No	No	No
No	Yes	Yes
Yes	No	Yes
Yes	Yes	Yes

Chapter 10

Worked example
related to real-life
scenario for learners to
apply learnt concepts.

WORD ALERT

Condition: The state of something in relation to its appearance, quality, or working order.

QUICK CHECK

In all logic gates except the NOT gate, there are two inputs. The inputs or outputs have two possible states. What are they?



Worked Example

We use Boolean logic all the time. Look at this situation using Boolean operators:
You have decided that you will do extra study if you are falling behind at school. You also decide that you will do extra study even when you are not behind if your friend asks you to study together. Express this using Boolean operators.

Solution

To express this **formally** and logically we need two pieces of information to make our decision and another piece to represent the result of the decision. We can name our information like this:

Information needed to make decision

(behind at school) = TRUE if fall behind. If not, FALSE.

(friend asks you to study) = TRUE if friend asks you to study. If not, FALSE.

Result

(do extra study) = TRUE if we decide to do extra study. If not, FALSE.

Our logical expression is then:

(do extra study) = (behind at school) OR (NOT (behind at school) AND (friend asks you to study))

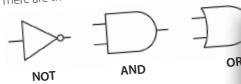
This expression uses the three Boolean operators: NOT, AND, OR.

Activity

- Write a logical expression like the example above for this given scenario.
There are two methods of getting to your part time job on time. You can get the bus but only if wake up before 9.00am. If you wake up after this time you will need to ask your parents to take you in the car. If you wake up before 9.00am but your parents offer to take you, then you will always say yes as it is easier.
- Draw the Boolean Algebra symbols for the following:
 - A NOT B
 - A AND B
 - A OR B

Types of logic gate

There are three basic types of logic gate that will be examined in this chapter: NOT, AND, and OR.



The left side of the logic gate is **referred to as** the input. We can use a truth table to show the function of the logic gate. These truth tables display all possible combinations of inputs and the resulting output.

complicated variations of the circuits, or to draw all known logic gates on individual cards and create their own combined logic gates to test a friend. For example, one student may combine an AND and a NOT gate. This would then require the friend to create the truth table for all the possible combinations, including the intermediate inputs.

Activity

Support only those students that require help by explaining that the name 'NOR' tells us that this is an OR gate and a NOT gate, so the missing gate is an OR gate. The intermediate outputs at P are simply those of a normal inclusive-OR gate:
0 = neither A nor B is true
1 = A is true
1 = B is true
1 = A and B are true
The NOT gate then reverses this:
0 = neither A nor B is true but is reversed by the NOT gate so 1
1 = A is true but is reversed by the NOT gate so 0
1 = B is true but is reversed by the NOT gate so 0
1 = A and B is true but is reversed by the NOT gate so 0

Challenge more able students to express the circuit in a logic statement or Boolean algebra.

Workbook

Exercise 4

Ask students to complete Exercise 4 in the workbook by completing the truth tables with inputs and intermediate and final outputs.

AO1: Demonstrate knowledge and understanding of the principles and concepts of computer science.

AO2: Apply knowledge and understanding of the principles and concepts of computer science to a given context.

AO3: Provide solutions to problems by evaluating computer systems.

Answers: All answers to questions in the Workbook are available at resource.marshallcavendish.com/teacher.

Students can check the answers to Let's Practice at resource.marshallcavendish.com/student.xxxxx.xxxxxx.

Logic circuits with more than two inputs

Take students step-by-step through the two parts of the circuit to obtain the intermediate outputs and then use these to calculate the inputs and output of the last gate. Encourage them to fill out a truth table for each stage as they go.

Ask students to check with their peers to verify the initial inputs, intermediate outputs and final outputs.

WORD ALERT

Formally: Officially / Explicitly

HELPFUL NOTES

In all logic gates except the NOT gate, there are two inputs. The inputs or outputs have two possible states: a value of 1 or a value of 0.

Activity with real-life scenarios for learners to apply the theory they have learnt.

Worked example

Make sure the students understand the scenario and can explain it back to you before starting.

Activity

- Ask students to follow exactly the same steps as the worked example and the presentation in their book. This problem is slightly more challenging as it is abstract – there is no real-life scenario to accompany it.
- Writing a logic statement may seem a little daunting. Support only those students that need it by helping them to work backwards from X.

Workbook

Exercise 5

Ask students to complete Exercise 5 in the workbook by completing the truth tables with inputs, intermediate and final outputs.

AO1: Demonstrate knowledge and understanding of the principles and concepts of computer science.

AO2: Apply knowledge, and understanding of the principles and concepts of computer science to a given context.

AO3: Provide solutions to problems by evaluating computer systems.

Answers

All answers to questions in the Workbook are available at resource.marshallcavendish.com/teacher.

Students can check the answers to Let's Practice at resource.marshallcavendish.com/student.xxxxx.xxxxxx.

Writing logic circuit statements

Students have already seen logic circuit statements in the previous section, where the intermediate outputs were expressed as $P = (A = 1 \text{ AND } B = 0)$ and $Q = (C = 1 \text{ AND } B = 0)$. Revise this and go on to explain that in the previous example the final statement would be:

$X = (A = 1 \text{ AND } B = 0) \text{ AND } (C = 1 \text{ AND } B = 0)$.

Through the **inquiry-based** approach, learners are encouraged to continually ask questions and reflect on their understanding. This encourages **active learning** and promotes **self-directed learning**.

Curiosity & Digital Literacy prompts learners to explore concepts further and apply what they have learnt through different modes of digital media.

Enrichment provides additional information and activities that encourage further exploration of concepts.


Reflect encourages learners to delve deeper into concepts covered and to hone their **critical thinking & problem solving** skills.

Collaboration & Communication Activities to engage learners in discussion and hone their communication skills.

Creative Thinking Challenge higher ability learners to find out more about concepts covered in the classroom.

Chapter 10

NOT gate



The NOT gate takes a single input, A in the diagram above, and always produces the opposite of that input in a single output, X.

Here is the truth table for the NOT gate. It displays all possible combinations of inputs and the corresponding outputs for the NOT gate. There are only two possible outputs for a NOT gate: 0 and 1.


Input	Output
A	X
0	1
1	0

Besides constructing truth tables, we can describe each gate using logic notation and Boolean algebra. In this case the output is as follows:

Logic notation: $X = \text{NOT } A$

Boolean algebra: $X = \bar{A}$

AND gate



The AND gate takes the inputs A and B and produces the output, X. If both inputs are 1, then the output will be 1, but otherwise the output will be 0.

Here is the truth table for the AND gate above.


Inputs		Output
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

Logic notation: $X = A \text{ AND } B$

Boolean algebra: $X = A \cdot B$

A and B show all possible combinations of inputs, so there are a total of four possible output states.

OR gate



The OR gate takes two inputs, A and B, and produces output X. If either or both inputs is 1, the output will be 1.

Chapter 1

Activity

Ask students to collaborate in small groups to make posters that display the different types of hardware. For each of the hardware types, they should write a short description of the function and usage in everyday life.

Allow each group to present their posters to other students to practice communication. Get them to discuss the advantages and disadvantages of the types of hardware available.

Workbook

Exercise 1 (10 minutes)

Ask students to complete Exercise 1 in the workbook by matching the items of internal hardware with their function.

Support students to list any external hardware.

Challenge higher ability students to list the advantages and disadvantages of two or more operating systems with regards to the user experience and possible ways to interact with the operating system. Ask these students to find out the differences between proprietary and FOSS OSs and the advantages and disadvantages of both. They should consider the following:

- security and vulnerability to attack
- stability
- fragmentation of versions
- commercial vs community support

System software

Warmup

Ask students to revisit hardware again. Tell them to list the differences between hardware and software.

As a review exercise, get students to construct a dichotomous key for hardware.

Hardware can be classified as internal and external, and in the same way, software can be classified as application and system software.

Ask the students if they know about the differences between application and system software. Give a broad distinction:

- used by user (visible)
- used by computer (invisible)

Give examples of both types, e.g. the BIOS starts up the computer and the OS gets everything ready for the user to work with, without them having to do anything. Word needs the user to do something to produce a document.

Work through the section and explain the key functions of system software. There are basically five types:

- Operating system (OS)
- Device drivers
- Utilities
- Programming language translators
- Firmware

In this section, we deal with 1, 2 and 3 and touch on aspects of 4.

Explain the differences between system software and application software.

Teachers' development is supported through the comprehensive Teacher's Guide to aid in **effective lesson planning and delivery** in the classroom.

Layout and sidebar features within Student Book designed to aid non-specialist teachers.

Chapter 7

HELPFUL NOTES

Data validation checks include presence, range, length, format, consistency, and type.

ENRICHMENT

Validation checks sometimes display a message known as a prompt box to let the user know the data entered is not valid.

REFLECT

Different form fields can have different validation checks based on the type of data entered. Can you suggest a validation check for entering an appropriate password?

DEFINITION

Validation: the process that helps the system know the data entered is correct.
Validation check: testing for validations.

QUICK CHECK

List the different data validation checks.



DEFINITION

Test strategy: plans for testing the system.

7.5 Data Validation and Verification

When creating coding for a new system, it is important that a programmer considers all the input of data that will be coming into the program. Validation checks on data are therefore essential to the correct working of the program, and these checks ensure inputted data follow the rules. If the data does not follow the rules set by the checks, the data will be rejected by the program.

7.5.1 Validation

There are several types of **validation check** that a programmer can implement into their code where user input is required.

Type of Validation	Purpose	Example Usage
Range Check	This checks for data input that falls within a range, and can apply to numbers, dates and characters.	A date of birth is required and the program requires a user to be older than age 13.
Length Check	This checks whether an input is too long or too short.	A password or passcode is required and must be a particular length.
Presence Check	This checks whether an input has been made or not, and will not allow a process to continue until something has been entered.	The quantity of items ordered was required to make a stock system calculate a total.
Format Check	This checks to see if data has been entered in the correct format for the input.	A date is required in DD/MM/YYYY format.
Check Digit	This checks for the final digit in a code of numbers and is calculated mathematically from all of the other digits in the code.	A number from a barcode needs to be stored.

7.5.2 Verification

It is one thing to have the data entered in the table above.

There are two main types of verification:

- **Double entry** – one. For example, ensure it is an integer.
- **Visual check** – spot obvious errors.

7.6 Test Design

Testing every procedure that leads to errors to the program.

Support and Challenge cater to diverse mix of learners with differing learning needs and help teachers to scaffold learners' learning in class.

Step-by-step lesson notes to aid in sequencing lessons in an engaging and meaningful manner.

Chapter 10

Worked example

Go through the worked example of two people walking along a corridor.

It is sometimes difficult to find examples of XOR gates in real life. The corridor metaphor works well here. Ensure students understand that the gate only works if A OR B are near the windows. If they are both near the windows, then they will crash into each other.

Support students by explaining that Anne AND John can't ride the bike at the same time.

Challenge more able students to think of other 'exclusive-OR' scenarios.

Activity

- 1 Question 1 describes the NAND gate. If either input is true then the output is false.

Support students by asking them to imagine the scenario with a normal AND gate. If both the window and the door are closed, then the output will be true.

1, 1, 1 = if both the window and the door are closed there is current to the alarm

1, 0, 0 = if only the window is closed there is no current to the alarm

0, 1, 0 = if only the door is closed there is no current to the alarm

0, 0, 0 = if both the window and the door are open there is no current to the alarm

But in this case the output is reversed:

1, 1, 0 = if both the window and the door are closed there is no current to the alarm

1, 0, 1 = if only the window is closed there is current to the alarm

0, 1, 1 = if only the door is closed there is current to the alarm

0, 0, 1 = if both the window and the door are open there is current to the alarm

(The solutions can be found in the Teacher Guide portal online and at the back of the Teacher's Guide.)

- 2 The tables represent the XNOR and NAND gates.

Workbook

Exercises 2 and 3

Ask students to complete Exercise 2 in the workbook by labelling the gates and Exercise 3 by filling in the truth tables for each gate.

AO1: Demonstrate knowledge and understanding of the principles and concepts of computer science

AO3: Provide solutions to problems by evaluating computer systems

Answers

All answers to questions in the Workbook are available at resource.marshallcavendish.com/teacher.

Students can check the answers to Let's Practice at resource.marshallcavendish.com/student. xxxxx xxxxxx

10.2 Combining logic gates

Warmup

Revise how an AND or OR gate followed by a NOT makes a NAND gate and explain that we can also represent this as a logic circuit; as there is more than one gate involved.

Logic circuits

Guide the students through breaking down logic circuits into two parts and show how the truth tables of logic gates in the previous sections relate to logic circuits. Allow students to review and reflect on the previous exercises and see how circuits are simply chains of two gates. Each stage has its own output that feeds into the next stage. Help students with the construction of the truth tables with two or more possible inputs by introducing the intermediate inputs in the truth table – make sure they understand the significance of the intermediate column in the table. Explain how we try to give a truth table for the entire circuit without the intermediate outputs, so we can remove these once we have worked them out.

Worked example

Go through the truth table for the logic circuit.

Support students by taking them through the steps. For example, inputs A and B have an output, but it is not the final output of the circuit. So, we begin again at 'P'; P inputs into the last gate, resulting in X. It is useful to show:

- the initial inputs
- the intermediate output
- the final output

Challenge higher-ability students to try out more

1. Computer Systems
2. Data Transmission
3. Hardware
4. Software
5. The Internet and Cyber Security
6. Automated and Emerging Technologies
7. Algorithm Design and Problem Solving
8. Programming
9. Databases
10. Logic Gates and Circuits

You may also be interested in:



Marshall Cavendish Education Cambridge IGCSE™ ICT series is a comprehensive two years programme designed to support learners with their study of the Cambridge IGCSE and IGCSE (9-1) ICT syllabuses (0417/0983).

This IGCSE ICT series encapsulates the Cambridge Approach into a suite of accessible and approachable learning materials that support blended learning.

Marshall Cavendish Education Cambridge IGCSE ICT series promotes visual learning and delivers an engaging learning experience. Difficult concepts are scaffolded and broken down to convey bite-sized concepts, with worked examples supports new learners.

To nurture a 21st century practical problem solver, this series includes real-life scenario-based problems and situations for learners to apply scientific and technological concepts learnt to practical aspects beyond the confines of the classroom.

Through engaging chapter openers, the friendly and concise language used, and the visual approach by means of colourful illustrations and infographics to simplify learning concepts, our package delivers an engaging and enjoyable learning experience. This enables learners to develop necessary skills to embrace the rapidly changing technological landscape and become future thinkers and problem solvers.



Python Programming with Marshall Cavendish Education

In conjunction with the best Python Curriculum Developer, Marshall Cavendish Education has created and curated a complete set of fun and engaging lessons that are 100% C.S.T.A compliant and in accordance to K-12 guidelines.

Suitable for both private and public schools, this courseware has 20 to 30-hour programmes for 10 to 16 year olds covering basics to intermediate and advanced python doctrines. Mapped to S.T.E.M. academic topics, this program aids learners in acquiring comprehensive understanding of their corresponding academic topics - Mathematics, Sciences, Geography, History, etc.

Take on the world of Python with MCE! This programme is now available on MCEduhub.

This series has not been through the Cambridge International endorsement process.



Cambridge IGCSE™ Information & Communication Technology Brochure

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1 Reduce learning obstacles and achieve proficiency in concepts

2 Build learners' confidence by linking theory to real-life applications

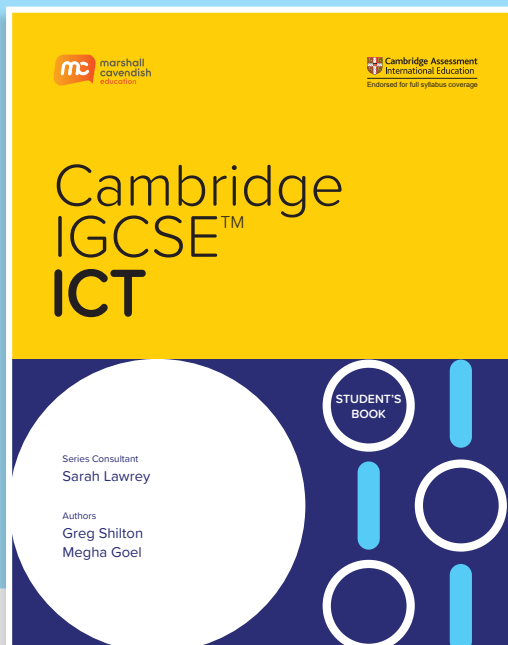
3 Prepare learners for the future by equipping them with 21st century competencies

4 Enhance teaching and learning effectiveness with digital resources

What's in Our Package?

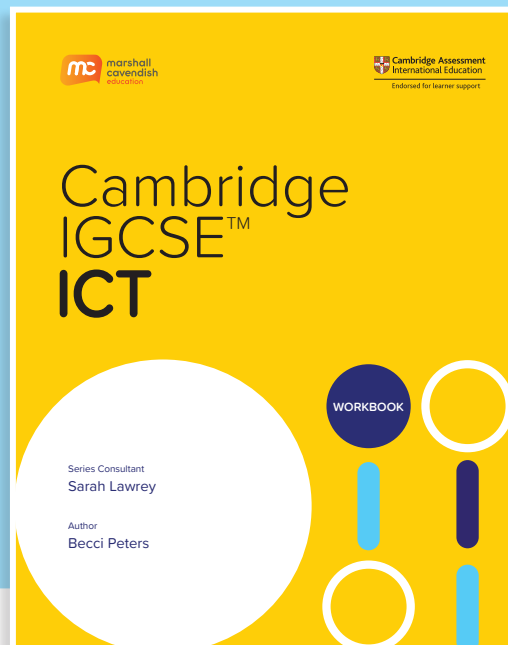
Student's Book

ISBN 9789814941563



Workbook

ISBN 9789814941570



Teacher's Guide

ISBN 9789814941587



Additional Digital Resources

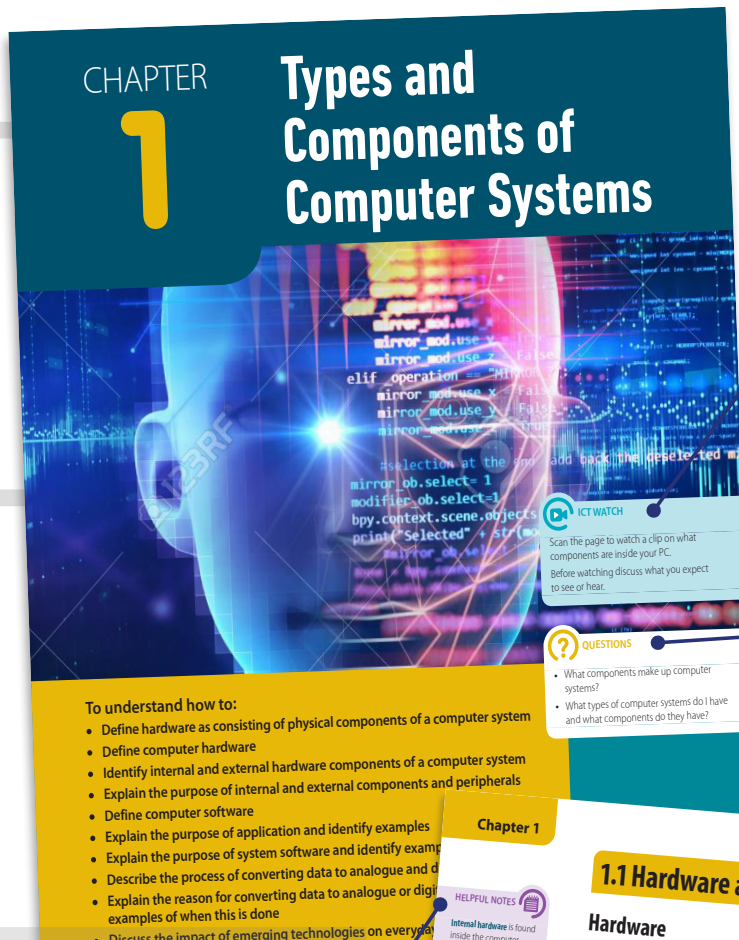
- Enhanced eBooks
 - Ability to annotate, save and submit work
- Digital Teacher's Guide
- Editable Resources:
 - Scheme of Work*
 - Lesson Plans
 - PowerPoint Slides*
- Source Files with Instructions*

**These resources will not go through the Cambridge International endorsement process.*

Reduce Learning Obstacles and Achieve Proficiency in Concepts

With its **clear and simple language**, this series cater to learners for whom English may not be the first language. The **highly-visual** and **clearly-organised content** is also designed to guide learners of various learning readiness to master the syllabus. In addition, the use of technology helps to **enrich and enhance learning**.

Clear learning objectives are aligned to the Cambridge syllabus.



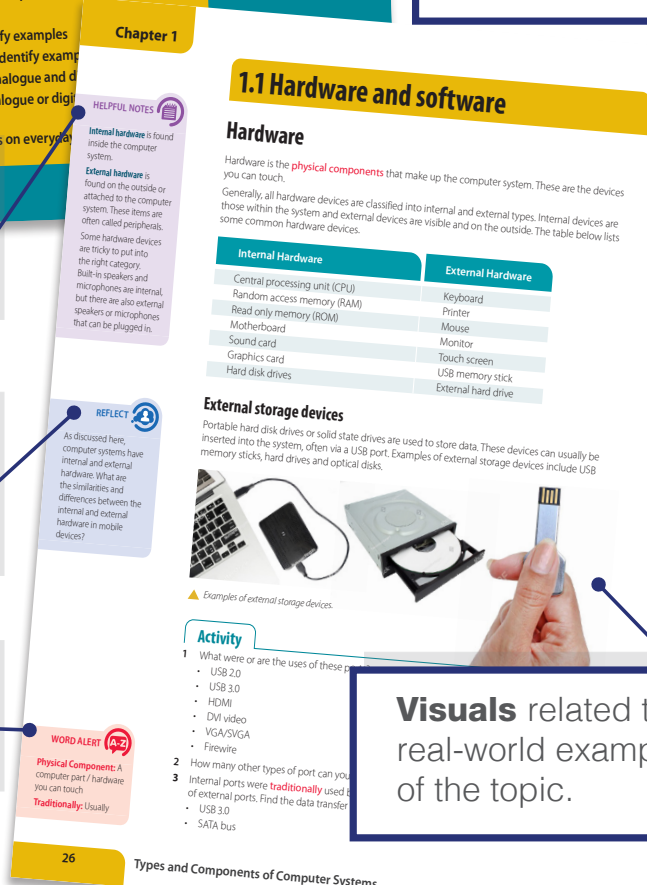
Watch Feature with videos and interactives to engage learners and promote ease of learning.

Questions to trigger learners to think about how the topic relates to their daily lives.

Helpful Notes provide important notes and study tips that are useful to learners.

Reflect allows learners to reflect on their learning and their identify gaps in learning which they can work on.

Word Alert provides the commonly used vocabulary in the series.



Visuals related to real-world examples of the topic.

Bite-sized information to guide learners in learning concepts better.

Activity with real-life scenario for learners to apply the theory they have learnt.

- Mobile devices tend not to have ports. Some have USB or mini USB sockets. Many have jack sockets for audio and they also have slots for external memory cards.
 - What type of memory cards do you know about? Can you name them?
 - What are their data transfer speeds? What are their **capacities**?
- If mobile devices don't have ports, explain how we can do the following:
 - connect to another monitor or TV
 - print
 - transfer data

Software

Software refers to programs that allow the computer system to function. Without software, the hardware components would be useless. Software allows the processing of electronic data and we use it for doing various things with a computer, for example:

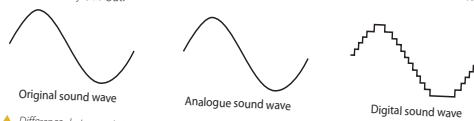
- writing
- creating images
- making presentations
- watching videos
- communicating with others
- browsing the Internet

Software can be **categorised** into application software and system software.

Analogue and Digital data

- Students need to know the characteristics of analogue and digital data
 - Differences between analogue and digital data
 - The need to convert analogue to digital data so it can be processed by a computer
- We know computers understand binary values and that all data must be converted into this for it to be processed. Let's look at how sound is recorded to show the need for converting analogue to digital data.

A microphone is used to record our voice; this is an analogue signal. Analogue signals are pieces of data that continuously change. Therefore, analogue signals need to be converted into digital data so computer systems can process it and store it. A device called an analogue to digital converter (ADC) is used to carry this out.



▲ Differences between digital and analogue data.

The digital sound wave creates the curve digitally after the sound has been sampled at regular intervals. Taking samples more regularly therefore improves the quality of the sound as it will be closer to the original sound wave.

However, at times we need to convert the digital signals back to analogue. For example playing your favourite song on your smart phone into your earphones. This can be done using a digital to analogue converter (DAC). The digital data is stored on your smart phone but would then be translated to analogue so you can hear it.

Activity

- Draw a comic strip showing how your favourite song is recorded and then uploaded to the Internet.
- List examples of devices which have a DAC or ADC built in.

Chapter 1



Exercise 1 and 2 in Workbook
Exercise 3 in Workbook



WORD ALERT
Capacities: Amount of data a device can hold/contain
Categorised: Ordered / Sorted

Link to workbook questions at appropriate junctures to reinforce learning.

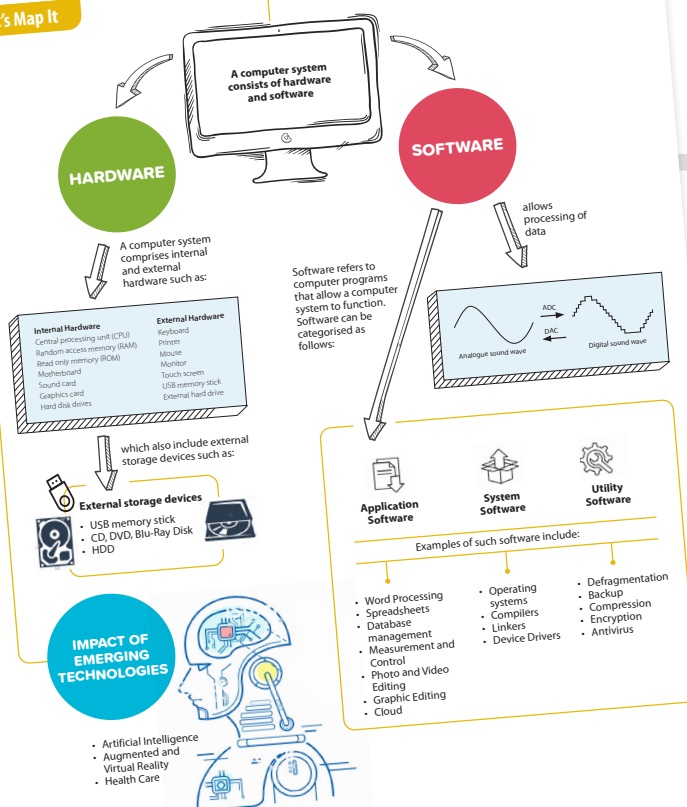


ENRICHMENT
There are several factors that affect the size and quality of sound files. Can you find out what they are?

Enrichment provides suggested activities to encourage learners to relate the concepts learnt to their own lives, promoting deeper understanding.

Chapter 1

Let's Map It



Let's Map It

provides a quick visual summary of the concepts for each chapter and facilitates learners in their revision.

Build Learners' Confidence by Linking Theory to Real-Life Applications

This series create opportunities for learners to **engage** in their learning, as they **make the connection** between the theory they learn in the classroom to real-world scenarios through the various activities in the book.

Practical ICT

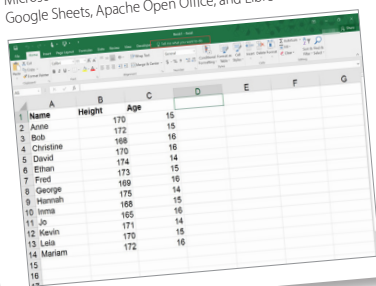
lessons to train learners on skills necessary for the future.

Spreadsheet

Spreadsheet software is used to organize, analyze and manipulate numerical or text data in a table form. The data are arranged in a table based on a certain numbering format to denote the cells arranged in lettered columns and numbered rows. Spreadsheets use something called formulae to help manipulate and produce data. These formulae allow users to quickly compare and calculate data. Standard features of spreadsheet software include the following:

- inputting and formatting of data
- inserting formula and doing calculations
- sorting and graphing of data

Microsoft Excel is a commonly used example of spreadsheet software. Other programs include Google Sheets, Apache Open Office, and Libre Office.



	A	B	C	D	E	F	G
1	Name	Height	Age				
2	Anne	170	15				
3	Bob	172	15				
4	Christine	168	16				
5	David	170	16				
6	Ethan	174	14				
7	Fred	173	15				
8	George	169	16				
9	Harriet	175	14				
10	Ismia	168	15				
11	Jo	165	16				
12	Kevin	171	14				
13	Leila	170	15				
14	Mariam	172	16				
15							
16							

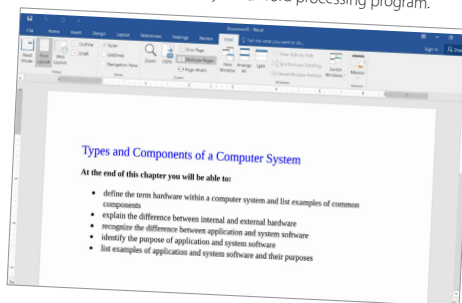
Example of spreadsheet software.

Word processing software

Word processing software is used for creating, editing, formatting, and manipulating text documents. Hardware devices such as a keyboard or a mouse are used for typing and inputting text. Standard features of word processing software include the following:

- inserting, deleting, cutting, pasting, copying, searching and replacing text
- changing the size, colour and types of fonts
- checking spelling and grammar
- importing photos, images, pictures and simple drawing tools

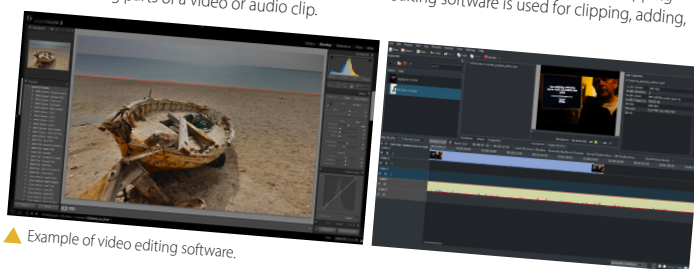
Microsoft Word is a commonly used word processing program.



Example of word processing software.

Photo and video editing software

Photo editing software is used for changing the colour, saturation, and tone of photos, cropping them, and changing features to enhance them. Video editing software is used for clipping, adding, and removing parts of a video or audio clip.



Example of video editing software.

Graphic editing software

Graphic editing software is used for creating and editing illustrations, designs, logos, three-dimensional images, animations, photographs, and other images. It is able to import and export various graphic file formats for example, .jpg.



Example of graphic editing software.

The ICT application also helps develop skills that learners can use to apply in document production, data manipulation, data analysis and website authoring.

Prepare Learners for the Future by Equipping them with 21st Century Competencies

Through the **inquiry-based** approach, learners are encouraged to continually ask questions and reflect on their understanding. This encourages **active learning** and promotes **self-directed learning**.

Critical Thinking & Problem Solving encourages learners to have self-awareness of their thought process.

REFLECT

As discussed here, computer systems have internal and external hardware. What are the similarities and differences between the internal and external hardware in mobile devices?

External storage devices

Portable hard disk drives or solid state drives are used to store data. These devices can usually be inserted into the system, often via a USB port. Examples of external storage devices include USB memory sticks, hard drives and optical disks.



▲ Examples of external storage devices.

Creative Thinking

Challenge higher-ability learners to find out more about concepts covered in the classroom.

Challenge higher-ability learners to find out more about other high-level programming languages and how such languages are being used.

Introduce utility software as tools to optimize processes, configure, or maintain a computer and to support the computer infrastructure. Ask students if they have ever performed processes such as defragmentation, backup and compression.

Curiosity & Digital Literacy

prompts learners to explore concepts further and apply what they have learnt through different modes of digital media.



Activity

Ask students to collaborate in small groups to make posters that display the different types of hardware. For each of the hardware types, they should write a short description of the function and usage in everyday life.

Allow each group to present their posters to other students to practise communication. Get them to discuss the advantages and disadvantages of the types of hardware available.

ENRICHMENT

Although Microsoft Word is the most commonly used word processing software, there are other packages. Can you name them?



ENRICHMENT

There are several factors that affect the size and quality of sound files. Can you find out what they are?

Collaboration and Communication

Learners recognise the importance of collaboration to reach an end goal and learn to accept a range of opinions, experiences and insights.

Revision Checklist encourages **active learning** and promotes **self-directed learning**.

Chapter 1

Revision checklist

Types and components of computer systems	Need to revisit	Satisfactory	Confident
I can define hardware and explain the need in a computer system			
I can identify internal hardware components of a computer system			
I can identify external hardware components of a computer system			
I can explain how and why analogue data needs to be converted to digital data			
I can define software and explain the need in a computer system			
I can identify internal hardware components of a computer system			
I can define two types of software – application and system software			
I can identify examples of system software for specific purposes			
I can identify examples of emerging technologies and recognise the impact on everyday life			

Teachers' development is supported through the comprehensive Teacher's Guide to aid in **effective lesson planning and delivery** in the classroom.

Each chapter starts off with a list of **assessment objectives** and its **learning objectives**.

List of inquiry-based approach activities help educators to engage learners actively in a dynamic learning environment and instill good learning habits.

Differentiated Instruction to stretch learners' abilities further using the **Challenge** teaching prompts and suggestions.

Differentiated Instruction to help learners who need additional scaffolding with the **Support** teaching prompts and suggestions.

CHAPTER

1

Types and components of computer systems

Assessment objectives

- AO1: Recall, select and communicate knowledge and understanding of ICT
- AO2: Apply knowledge, understanding and skills to produce ICT-based solutions
- AO3: Analyse, evaluate, make reasoned judgements and present conclusions

Learning objectives

- Define hardware as consisting of physical components of a computer system
- Define computer hardware
- Identify internal and external hardware components of a computer system
- Explain the purpose of internal and external components and peripherals
- Define computer software
- Explain the purpose of application and identify examples
- Explain the purpose of system software and identify examples
- Describe the process of converting data to analogue and digital
- Explain the reason for converting data to analogue or digital and suggest examples of when this is done
- Discuss the impact of emerging technologies on everyday life

1.1 Hardware and software

Warmup

Students will have much experience using a personal computer, laptop, smartphone or any digital device. However, they may not know all the components that go into each of the different types of computers.

Do a quick survey to determine the number of students who own a mobile phone. Ask them what they use their mobile smart phone for. What are some of the tasks the smart phone is capable of?

Ask students what they see and observe around them about computers and computer systems in general, and to list down the things that they can associate with these, such as the computer screen, speakers, graphics, etc.

Also, highlight that some of these things they have listed fall under an umbrella term of 'hardware'. Some of these hardware items are easily identified, but others are harder to see.

Ask students to create an ICT dictionary/notebook that includes the key terms and definitions. This would prove beneficial in the long run as they can take notes and keep this throughout the course.

Hardware

Initiate a conversation by asking students to list as many types of hardware that can be seen or that cannot be seen. Using examples such as a cell phone, ask students if they can name as many types of hardware that are visible and not visible.

Challenge students to think of external hardware that could also be found internally in certain devices and the types of hardware that could be both internal and external. You could have further discussions about the brands in the market, the specifications of the hardware, etc.

Ask students to list important hardware parts of a mobile phone that are common among the different brands out there in the market.

External storage devices

Move on to talk about storage devices that could also be internal or external hardware.

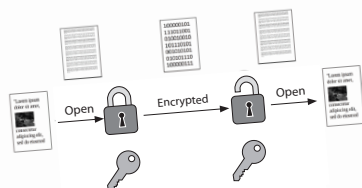
Challenge students to think of where the line between internal and external hardware is blurred, e.g. is a micro-SD card in a phone internal or external hardware?

Support students by asking them to think of a traditional desktop PC. Everything inside the box is internal and everything outside the box is external. Show them photographs or allow them to search on the internet for suitable images to illustrate these concepts. If you have a PC, let them see inside and show them the different components.

Chapter 1

Encryption

Support students by explaining that PGP (the method used in this diagram) sends a private key to all the people you trust. This key can only open messages and you have another key that can only close messages.



Challenge more able students by explaining different common encryption standards. For example, the Advanced Encryption Standard (AES) is a symmetric encryption algorithm and one of the most secure. AES is comprised of AES-128, AES-192 and AES-256.

Talk about other possible encryption methods, such as the RSA and 3Des. You could also introduce other ways to beef up security, such as the two-factor authentication (2FA). What are the other methods?

Activities

Ask students to reflect on the applications and purpose of system software.

How is it being used in computers and in other hardware?

Note that the need for tight integration of hardware and software provides an excellent user experience. As a discussion point, ask students how good hardware and software integration impacts the user experience.

- Are there any positive and/or negative impacts?
- How has such application or system software changed our lives?

Workbook

Exercises 4-9

Ask students to complete Exercise 4 in the workbook with the definitions of application and system software.

Exercise 5 is an extension activity for those students who need more challenge.

Question 1 of Exercise 6 is designed to show that the students have understood the basic function of the compiler and how it fits into the computer workflow.

Question 2 is an extension activity for those students who need more challenge.

Exercise 7 is a free activity where students demonstrate their understanding of the role of the linker and a basic understanding of libraries, object files and low-level programming.

Exercises 8-10 revise utility software:

- device drivers
- defrag software
- backup procedure and software
- compression software

AO1: Recall, select and communicate knowledge and understanding of ICT

AO3: Analyse, evaluate, make reasoned judgements and present conclusions

Answers

All answers to questions in the Workbook are available at resource.marshallcavendish.com/teacher.

Students can check the answers to Let's Practice at resource.marshallcavendish.com/student xxxxx xxxxxx

Recap and link learning objectives to **workbook** tasks.

Answers to the Workbook can be found.

Activities

with helpful teaching suggestion and activities to facilitate classroom discussion.

Activities to support and stretch learners to explore the subject of interest more deeply.

Wrap-Up activities to link learned concepts and solidify knowledge.

Analogue and Digital Data

Support students by explaining that all computer systems only understand digital data. All files and documents need to be converted to digital data to be used and stored. Help students understand the process of recording sound files and then storing them on their computer. Ask students what do sound waves look like and if they think a computer could replicate that digitally. Describe the process of sampling and how this works – show students a diagram of both an analogue and digital sound wave and look at differences and similarities.

Challenge more able students if they can think of other instances where analogue data may be required to be converted into digital or even the other way round.

Discuss how once an audio file has been saved on the computer system, how it is then played back to the students.

Activity

Students have seen examples of diagrams showing analogue data being converted to digital data. Ask students to create a comic strip showing a musician creating a song and all the steps in between before it reaches their smart phone and their own ears. The focus of this task should be on the conversion between analogue and digital data.

Emerging technologies

Support students by explaining that technology is ever evolving and new devices are being produced that are more advanced. These technologies are being developed to impact human lives but this does not always mean positively. Provide students with a range of positive AI, AR, VR examples of when they have a positive and negative impact on our lives.

Challenge more able students by asking them to carry out research into AI, AR and VR and make a prediction as to what they believe the future holds and if it will benefit everyday life or not.

Activity

Ask students to create a timeline detailing the start of AI in the modern world all the way up to today's devices. Students will require the internet to carry out research but you could also give students a range of devices to look at or start them off.

Wrap Up!

Ask students to think back to the opening unit question (once one has been selected and ask them to explain their answer and provide examples of what they have covered in this unit and how it relates to the question.

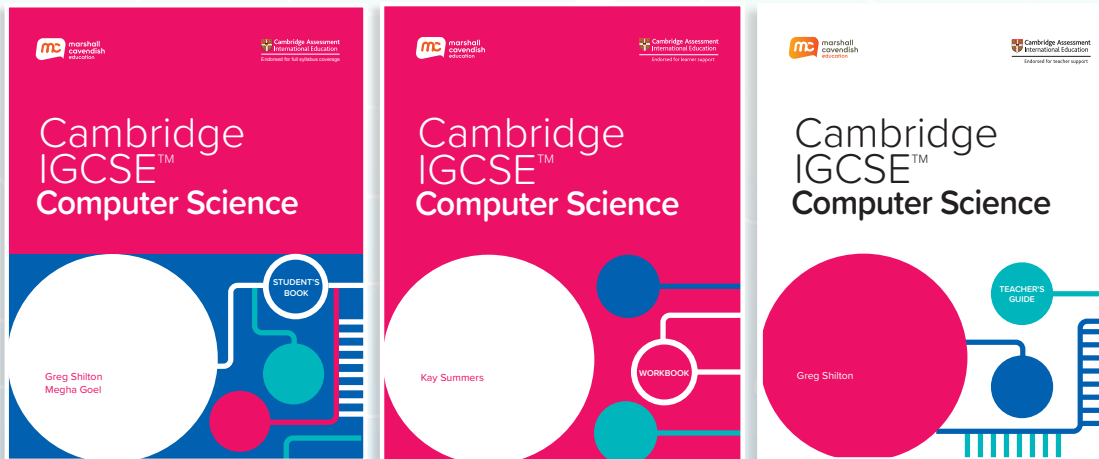
- What types of computer systems do I know and use and what components do they have?

Ask students to write an appropriate newspaper article that discusses a specific area within the unit. Students could search for facts and real life stories to include or create their own.

Chapter 1

1. Types and Components of Computer Systems
2. Input and Output Devices
3. Storage Devices and Media
4. Networks and the Effects of Using Them
5. The Effects of Using IT
6. ICT Applications
7. Systems Life Cycle
8. Safety and Security
9. Audiences
10. Communication
11. File management
12. Images
13. Layout
14. Styles
15. Proofing
16. Graphs and Charts
17. Document Production
18. Databases
19. Presentations
20. Spreadsheets
21. Website Authoring

You may also be interested in:



Marshall Cavendish Education Cambridge IGCSE™ Computer Science is a comprehensive two-year programme designed to support learners with their study of the Cambridge IGCSE and IGCSE (9-1) Computer Science syllabuses (0478/0984).

This IGCSE Computer Science series encapsulates the Cambridge Approach into a suite of accessible and approachable learning materials that support blended learning.

It encourages active and inquiry-based learning which helps learners to develop 21st century skills. It is also designed to support learners for whom English is not their first language by using simple and concise language in its content.

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Take on the world of Python with MCE! This programme is now available on MCEduhub.

This series has not been through the Cambridge International endorsement process.



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Cambridge IGCSE™ English as a Second Language Brochure

**2nd
Edition**

**BEYOND BASICS
REIMAGINE EDUCATION**

This **Marshall Cavendish Education Cambridge IGCSE™ English as a Second Language 2nd Edition series** is designed to support learners studying the Cambridge IGCSE and IGCSE (9-1) English as a Second Language syllabuses (0510/0511/0991/0993) for examination from 2024.

The series focuses on building communicative competence and linking language to life. The units are carefully structured according to the various functions that we use language for, such as informing, explaining, persuading and giving opinions. By learning language in this way, students will build strong communication skills, based around real world contexts that they can relate to.

This series helps to equip students for the modern world by including a unit on 21st century skills such as media literacy and using social media productively. The units also include a focus on values. For example, a discussion may be about personal development, or building links with the wider community. Alternatively, students may be prompted to discuss issues and ideas which will highlight the purpose or worth of a task in relation to future employment. This kind of reflection will help students become future-ready.

Thorough coverage of language skills and grammar, as well as a focus on exam preparation, means that students will gain a solid grounding in English before moving on into higher education.



1. Units structured according to how we use language in real-life situations

2. Highly visual with relatable real life contexts and photos

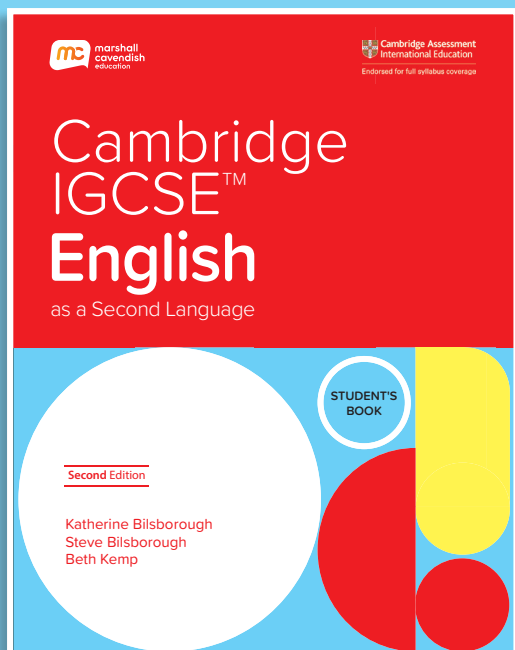
3. Builds communication skills and links language to life



What's in Our Package?

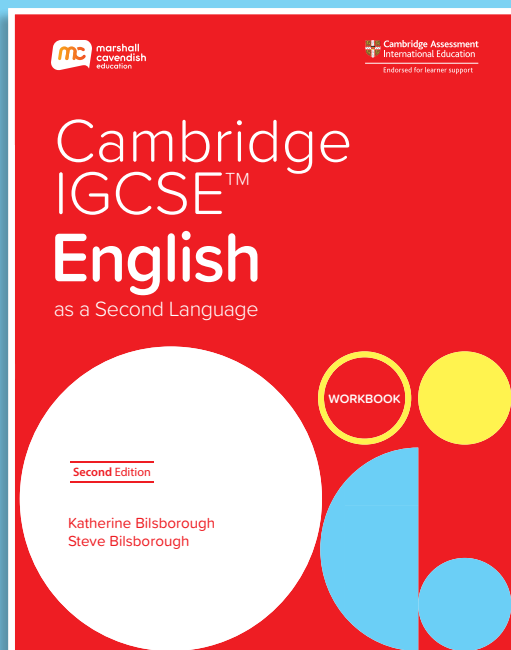
Student's Book

ISBN 9789815027716



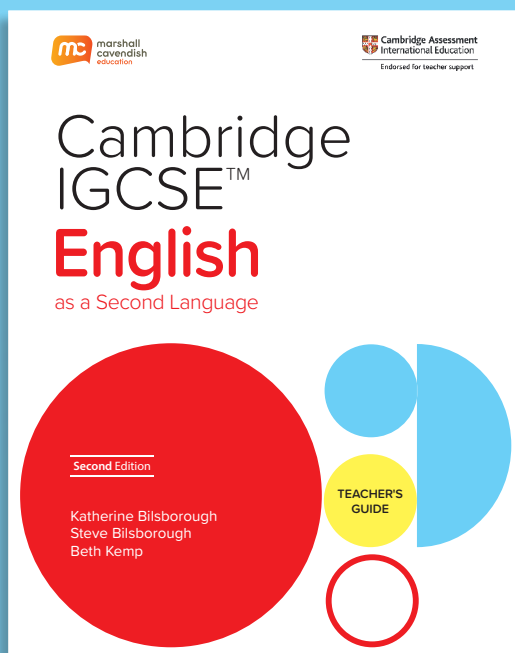
Workbook

ISBN 9789815027723



Teacher's Guide

ISBN 9789815027730



Digital Resources

- eBook (contains all the audio recordings)*

*These resources will not go through the Cambridge International endorsement process.

The second edition includes a suite of specially crafted animations* that reuse key language from the units in new contexts. Students can now enjoy a range of different styles from humorous cartoons to more formal and factual presentations and hence increase learner engagement and enhance the learning experience. Ideas for teachers on how to use the animations in class have also been included.

Well-rounded Themes

Units are structured according to functions we use language for. i.e. informing, complaining, persuading, negotiating, explaining, etc.

Unit Opener

Each unit opener starts with a list of learning objectives linked to specific sections in the unit for targeted teaching and learning.

Marker Recognition Technology*

allows access to all the audio, animations and word lists to enhance of learning experience.

Expressing Opinion 2: Using English to critique and review

In this unit you will learn to:

- recognise and interpret language used to review and critique
- review items, events and products using appropriate structures and vocabulary
- recognise vocabulary and phrases expressing shades of opinion
- use comparisons as a way of expressing and fine-tuning opinions

Additionally, you will have the opportunity to practise:

- discussing items, events, arts and media products to review them
- listening in a variety of contexts where reviews might be found
- reading a range of texts that review products, arts and events



VALUES
In this unit, you will have many opportunities to practise giving your views. Appearing confident in these views will help you to connect across well, so make sure that you are clear about your values.

Values

Students find the purpose and make connections between language skills learnt and the wider world.

*These resources will not go through the Cambridge International endorsement process.

Lesson Heading

Language lessons are structured according to the specific skill focus of the lesson.

Warm-up

Before each lesson, suggested activities help recall and build contextual knowledge using relevant vocabulary.

Focus on Skills

Useful strategies are provided in the form of advice for students to take note of.

UNIT 1

READING 1

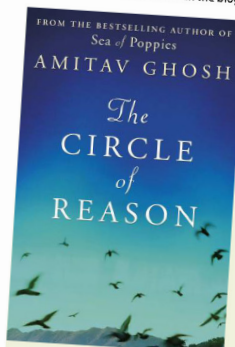
Warm-up

1 With a partner, discuss:

1. How can we find out about the lives of other people?
2. Think of a famous person from your country. What do you know about them?
3. Have you ever read a biography?

Scanning

- 2 Before reading in detail, scan the biography and quickly find out what job the person does.



Amitav Ghosh was born in Calcutta in 1956. He went to a boys' boarding school, and it was during this period that he decided to be a writer. As a schoolboy, he regularly contributed stories and poetry to the school magazine.

Ghosh went to Delhi University after finishing school, and then to Oxford University in the UK. When he finished university, he managed to get a job as a writer for the 'Indian Express' newspaper.

Ghosh writes mainly historical fiction. His first novel, published in 1986, is called 'The Circle of Reason'. It is about a young tapestry weaver called Alu. The Police plan to arrest Alu because they think he has committed a crime, but Alu refuses to give himself up and runs away. As the Police chase him across India and Africa, he meets all kinds of colourful characters.

His most recent work of fiction is the best-selling 'Ibis' trilogy. The books are about the first wave of globalisation that started in the early 19th century.

He attempts to explain the phenomena of globalisation in a story that takes us to different countries and spans decades. It is almost a million words long, and, according to *Swarajya* magazine, 'it is the most ambitious literary project ever undertaken by an Indian author.'

Ghosh also writes non-fiction. His essays have appeared in publications, such as *The New Yorker* and *The New York Times*. In his book, 'The Great Derangement: Climate Change and the Unthinkable', he writes about how people fail to understand the serious effects of climate change. In it, he explains how people prefer to ignore the consequences of climate change. It won the Utah Award for the Environment in 2018.

Ghosh's work has been translated into more than 30 languages and he has won lots of prizes and awards. In 2007, he won the Padma Shri, one of India's most prestigious civilian awards. In 2018 he was the first English-language writer to win India's highest literary prize, the Jnanpith Award.

Although Ghosh sometimes visits his hometown, Calcutta, as a visiting professor at the university, he chose to live in the USA. He lives in New York with his wife Deborah Baker (who is also an author) and his two children.

Finding information to answer questions on a biography

3 Answer the questions in your notebook.

1. Where did Amitav Ghosh first think about being an author?
2. What kind of things did Amitav Ghosh first write?
3. What genre are most of Ghosh's books?
4. What job does Ghosh's first fictional character do?
5. Where is 'The Ibis Trilogy' set?
6. How did a critic describe 'The Ibis Trilogy'?
7. Where could people read Ghosh's essays?
8. Which two events happened to Ghosh in 2018?
9. How do we know people read Ghosh's books all over the world?
10. What job does Ghosh's wife do?

Language Focus

Verbs followed by an infinitive

Some verbs are usually followed by an infinitive. An infinitive is a verb with 'to'. For example, 'to be'.

- He decided to be a writer.
- Alu refused to give himself up.
- He chose to live in the USA.

Common verbs that are followed by an infinitive include:

decide	agree	choose	threaten
want	refuse	prefer	learn
promise	plan	arrange	expect
offer	fail	hope	intend

4 Using the given words, write sentences in your notebook.

1. Yesterday / he / decide / join / drama club
2. Sorry / I / promise / study / harder next time
3. They / arrange / meet / six o'clock
4. When / I / finish school / expect / go / university
5. Next weekend / I / want / go / trip

Connect

5 Complete the sentences in your notebook.

1. Next year I hope ...
2. Right now I want ...
3. At the weekend I expect ...
4. When I finish studying I intend ...
5. When I am an adult I promise ...
6. Next summer I plan ...

6 Compare your sentences with a partner. Discuss what is similar and what is different about your hopes and plans.

UNIT 1

FOCUS ON SKILLS

Biographies are usually written in chronological order. This means the information starts with the early life of a person and continues in order, finishing with the latest information. Look for key dates and ages in a biography to help you work out the order of events.

Focus on Language

Explanations and clarifications of specific language points are given, to provide support and context.

Language Focus

Grammar is taught explicitly with clear explanations, contextualised examples, and plenty of practice.

Nurturing a Generation of Global Citizens with Lifelong Learning Skills

Unit 18 – a unit dedicated to exploring 21st century skills, such as media literacy and using social media productively

Focus on Values

encourages reflection and personal development, to help students become ready to take their place within their community and also as global citizens.

Connect

Opportunities for students to reflect and collaborate, to make links between language skills learnt and personal experiences.

UNIT 18

LIFE SKILLS

Warm-up

- 1 With a partner, discuss each of these life skills. Talk about how each skill could help you in your future career.

social skills productivity leadership initiative flexibility



- 2 Match the skills from Exercise 1 to the statements.

I'm good at getting my I don't mind what timetable I work to. I don't need my boss

Developing skills; using verbs with prepositions

- 4 Listen again and choose from the list A – F which opinion each speaker expresses. Use the letters only once. There is one extra letter that is not needed.
- A This employer wants employees who will do things without being told by a boss.
B This employer needs people who are good at talking to customers.
C This employer wants employees who are qualified in the field of human psychology.
D This employer needs people who can motivate members of their team.
E This employer wants workers who can manage their time well and achieve objectives.
F This employer wants people who can adapt to changing situations.

Discussion

- 5 With a partner, discuss:
1. Think of a job you'd most like to do. Give a brief job description.
 2. What do you think makes a good boss?
 3. What's the best way for a business to recruit staff in your opinion?
 4. Who do you know with good time management skills?
 5. How should a shop assistant deal with customers?



Language Focus

Verb + preposition

We use lots of verb + preposition collocations when we talk about work. Look at these examples.

- I need a person who can **respond to** changes.
- We **depend on** staff with excellent social skills.
- My company **deals with** customers.
- You should **apply for** the job.
- We **specialise in** customer care.

Other examples include: adapt to, concentrate on, help with, work for, participate in.

- 6 Think of local, national or international businesses that you know. List them. Then, make sentences about them using these prompts.
1. They specialise in ...
 2. They deal with ...
 3. In the future they might need to adapt to ...

Connect

- 7 Look at the list of life skills in Exercise 1 and talk to a partner about:
1. Which life skills do you think you already have? Give examples of experiences that illustrate these skills.
 2. Which life skills do you need to develop? Share ideas about how you could do this.

UNIT 18

Vocabulary Bank
job description
perform a task
a boss
a senior member of staff
set/achieve objectives
take risks
entrepreneur
competitive market
recruit (staff)
time management
deal with customers

UNIT 15

ADDITIONAL PRACTICE

Writing



Your class has been on a trip to a museum and your teacher has asked you to write a review for your class blog. Describe the experience and give your opinion of the museum. Here are two comments from other students on the trip:

The trip was a bit rushed. I wanted to spend more time in the art exhibition.

It was great to see real objects from history! The information about them was really useful.

The comments may help to get you thinking, or you can use your own ideas. Write 100 – 150 words. Up to 6 marks will be given for the content of your review and up to 6 marks for your use of language.

[Total: 12]

- 8 Write 150 – 200 words. Up to 8 marks will be given for the content of your review and up to 8 marks for your use of language.

[Total: 16]

Speaking

'Holidays rarely live up to our expectations.'

Discuss this topic. Use the following ideas to help you extend the conversation:

- a holiday you have taken recently or in the past
- your best and worst holiday experiences
- what your ideal holiday would be like
- advantages and drawbacks of planning for holidays
- the suggestion that people have unrealistic expectations for holidays.

[Total: 30]

Additional Practice

Exam-style questions with associated marks can be found at the end of every unit for more skill refinement to be examination ready.

Describing compromises reached; reported speech

Language Focus

Reported speech

When we report offers that other people have made, we change *I* to *he*. So *"I'll do it"* becomes *He said he'd do it.* (He said he would do it.) Here are some more examples:

"I'll carry the shopping home."	He said he'd carry the shopping home.
"I'll lay the table for lunch."	She said she'd lay the table for lunch.
"I'll clean the bathroom."	He said he'd clean the bathroom.

- 4 With a partner, take turns to report the offers in the speech bubbles, using *He* or *She*.

1 I'll tidy the living room.

4 I'll do the ironing.

2 I'll mop the floor.

5

3 I'll wash the dishes.

Writing a report

An informal report has the same structure

1. It states what the report is about.
2. It presents the facts.
3. It makes recommendations.

- 5 Use your notes to write a report on in Exercise 4 on page 195.

You can copy Part 1 and Part 3, and

When you finish, compare your report with your group to make sure you have the correct

- 6 Write a report based on the information

Glossary Words

Vocabulary that is indicated in blue can be found, along with accompanying definitions, in the Glossary section of the student book.

Glossary

accessories (n): additional clothing such as a scarf
after sun (n): a lotion to put on when you have sunburn
agenda (n): an underlying motive or intention
amateur (adj): unprofessional or unskilled
ambiguity (n): the quality of being open to different interpretations, unclear
application (n): a written request for something, such as applying for a job
artificial (adj): not real
assume (v): to think something without proof
audiobook (n): a book that you listen to, one that has been read aloud and recorded
audition (n): a trial to check suitability for a job or role
automation (n): the state of things operating automatically, i.e. by themselves, without human contact
awkward (adj): out of place or clumsy

B-movie (n): a low budget film
blueprint (n): a design plan
boarding school (n): a school where pupils live on site during term time
briskly (adj): quickly and with purpose
buff (n): a type of over-the-head scarf made from thin material that can be stretched worn in a variety of different ways
bulldog clip (n): a strong metal device for holding papers together

campfire (n): a small fire for cooking, made when camping
carbon footprint (n): the amount of carbon dioxide-producing activities carried out by a person or organisation
catchy (adj): interesting and easily remembered
cello (n): a large stringed musical instrument, usually played with a bow (like the violin), but the musician is seated with the cello standing on the floor
chairperson (n): the person who runs (chairs) a meeting
checklist (n): a list of items or tasks
chrome (n): a shiny metal-like material
chronological order (n): ordered by date
cinematography (n): the actual camerawork and photography of a film
civilisation (n): all human society
clarify (v): to make something clear and understandable
coat (n): a layer
compostables (n): things that can turn to compost, that can be broken down organically
compromise (v): to come to an agreement to settle
concept (n): an idea or design
concern (n): an important issue
concession (n): a compromise
consensus (n): an agreement

UNIT 11



STUDY SKILLS

You can use different colours to record new language. Copy the examples in the Language Focus box. Use different colours for the key parts of the sentences. For example: *I'll* (blue) *carry* (red), *He said* (red), *he'd* (green) *carry* (red).

Study Skills

Advice on how to categorise similar and related language skills for efficiency of revision.

consequence (n): the outcome of something
consumer (n): a person who buys products
consumption (n): the act of consuming – or using something up; in environmental terms, people buying and using too many unnecessary things
council (n): an organisation who look after a town or city
covering letter (n): a formal letter that supports a job application
crowdfunding (n): raising money through a large group of people

debate (n): a formal discussion, structured in a particular way
dehydration (n): the state of becoming ill because you haven't had enough water

delicates (n): in washing instructions, this refers to clothes which are made of fine or thin material, usually undergarments

demolish (v): to destroy something completely

devastating (adj): totally destructive

device (n): a machine, usually technological

director (n): the person on a film or television set in charge of directing actors and crew

disengagement (n): the state of not caring, of not being engaged

dizziness (n): the feeling like you are spinning

draw on (v): to use previous experience to help you with a current task

drawback (n): a small problem

dressings (n): bandages and plasters

drowsy (adj): sleepy

duped (v): to be deceived or tricked

edible (adj): able to be eaten

efficient (adj): something that is carried out in the best way possible

effort (n): to put your all into something

electric sander (n): a machine for smoothing wood

endearing (adj): a quality that makes people like the thing, something cute

entry-level (adj): describes jobs or training at the point where a person would normally enter the industry, i.e. at the beginning of a career

etiquette (n): the formal rules of politeness, observed in high society

faculty (n): a university department

fancy (adj): decorated

flood (n): a great overflow of rivers and streams, usually caused by heavy rain

fossil fuel (n): organic material such as oil, coal or natural gases used for fuels

freak wave (n): a huge, rare wave

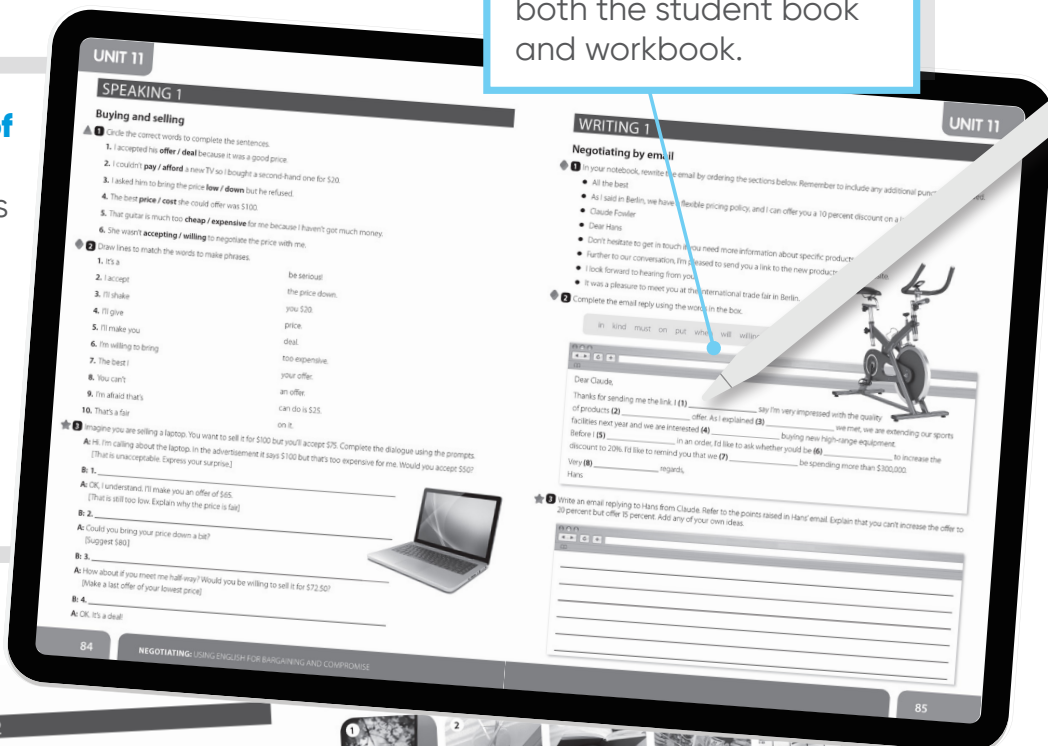
Annotatable Workbook

Annotatable features

allow students to make notes and write answers on-the-go for both the student book and workbook.

Differentiation of Activities

Three-level icons differentiate tasks to select what level of challenge they prefer from simple to more challenging.

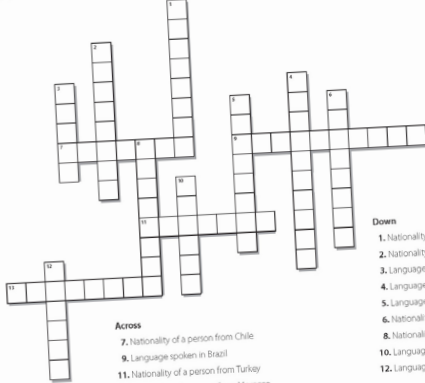


UNIT 8

LISTENING AND SPEAKING 2

Vocabulary

1 Use the clues to complete the crossword.



Across
7. Nationality of a person from Chile
9. Language spoken in Brazil
11. Nationality of a person from Turkey
13. Nationality of a person from Morocco

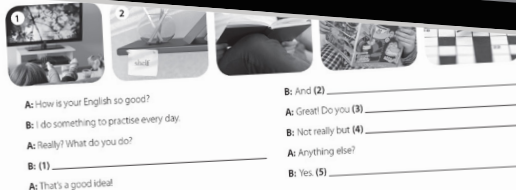
Down
1. Nationality of a person from Canada
2. Nationality of a person from Peru
3. Language spoken in Belgium
4. Language spoken in Vietnam
5. Language spoken in Japan
6. Nationality of a person from Algeria
8. Nationality of a person from Egypt
10. Language spoken in South Korea
12. Language spoken in Kuwait

Learning English

2 Match the two halves of the dialogues. Draw lines.

1. If you read every day, you learn new words.
2. If you don't study, you feel anxious.
3. How can I remember all the information?
4. Recording yourself speaking is a good idea.
5. Why don't you come to French classes with me?

- a. Because I'm not good at languages.
- b. You could try writing it in a diagram.
- c. That's true but reading is difficult.
- d. I know! That's why I always study.
- e. Not for me. I hate the sound of my voice.



SELF EVALUATION

Skills

How do you feel about the work you have done in each skill in this unit? Tick the boxes.

	1 I found most of this challenging	2 I found some parts of this challenging	3 Good. I'm ok with this	4 I'm very confident with this
Reading				
Writing				
Listening				
Speaking				

Language

Think about the language and grammar I would like to spend more time working on. I am pleased with my progress in _____

Self-Evaluation

An evaluation checklist at the end of each unit allows students to gain self-awareness and reflect on their learning and progress.

Various Activity Types

Students are well-equipped and exposed to practices of language and skills are presented in different contexts.

Unit 11

Negotiating: Using English for bargaining and compromise

In this unit, students will learn to:

- recognise language used to negotiate (R1, R2, R3, R4, L1, L2, L3, L4)

Student Book pages 181 – 198
Workbook pages 82 – 89

Warm-up

Teachers can engage student to recall and build upon contextual knowledge to arouse curiosity in material.

1: Reading 1

confident when you have to negotiate and reach a decision? Why (not)? Which negotiations are easiest/most important to reach a compromise?

Encourage students to share their thoughts.

Ask: What kind of decisions do you have to make each day? How do you reach a decision? What about when other people are involved? Encourage students to share their ideas.

Warm-up

Ask: Who can give an example of a negotiation they were involved in recently?

Invite responses from different students around the class. This will get students thinking about the general topic of negotiating. It will help contextualise the information in the blog post. Use the advice in the **Focus on Language** box to emphasise why it is so important to be clear when negotiating.

1 Students read the first situation and imagine what they would do. Then they share their ideas with a partner. They repeat the process with the second situation. Ask for a few ideas around the class.

Skimming

2 With a partner students tell each other what the negotiation is. Then they read the text and share their ideas.

Ask: Why is it important to be clear when negotiating? Encourage students to share their ideas. Elicit a few ideas about why it is important to be clear because the consequences can be serious.

Scanning

3 Students read the article and answer the question orally.

ANSWERS:
Preparation, Discussion, Clarification, Bargaining, Implementing the agreement.

Study Skills

Ask students to read the **Study Skills** advice and then complete this short exercise:

Write the word photo on the board. Then ask: What words can we make from this root? Write a list on the board as students make suggestions. Help where necessary by asking students to think of a person, an adjective, etc. Suggested words: photograph, photographic, photographer, photogenic, photography, photographed, photographable, unphotographable, unphotographed, re-photograph.

Reading comprehension

4 Students work individually to answer the questions about the article. They compare their answers with a partner before checking as a whole class.

Support by doing the exercise orally around the class. Ask different students to provide answers.

ANSWERS:

1. Preparation, Discussion, Clarification, Bargaining, Implementing the agreement.

Student Book notes

- with a handshake or a contract
- discuss = talk over, organise/solve = sort out, find = come across, support = back up, explain = point out

5 Students make notes under two headings related to negotiation. Encourage Extended students to develop their opinion. Then they compare their notes in pairs or groups of three. Encourage them to make precise notes but to be careful not to leave out any of the key information.

Support by eliciting a few of the missing notes orally around the class and writing some notes on the board. Build in a thinking stage so students are aware of the importance of choosing key words to express the main points.

SUGGESTED ANSWERS:

- What is negotiation?
- A way of settling differences peacefully
- It exists in all spheres of our lives

The five stages of negotiation:

- Preparation
- Decide what you want to achieve
- Think about what both sides want

Discussion

- Sort out the practical details
- Listen carefully

Clarification

- Explain advantages (with support)
- Establish common ground

Bargaining

- Make compromises
- Reach an agreement or walk away

Implementing the agreement

- Agree on obligations
- Work out an action plan for implementation

WORKBOOK

On page 82 of the Workbook there is an ordering exercise based on the five steps of negotiation.

Language Focus: Phrasal verbs – separable or inseparable?

Students read the explanations and examples. Make sure everyone understands the meaning of the phrasal verbs used in the examples: Turn down = refuse/reject, Look into = investigate

Challenge by asking students to write five example sentences with phrasal verbs they know. Then, with a partner they compare their lists and decide whether the phrasal verbs are separable or inseparable.

Answers and Transcripts

Reference material for both student book and workbook to adjust and plan lessons according to learning needs.

Embedded Professional Development

Short explanations, found within the lesson notes, rationalize why each activity or question prompt is important or useful for student learning.

Support and Challenge
Suggested activities for both learner support and additional stretch.

WORKBOOK

Students have further reading practice in the Workbook. They read a text about a negotiator and complete a comprehension exercise to practise the phrasal verbs from the text.

Lesson 2: Listening

Write a list of objects on the board that people might spend money on. For example: t-shirt, trainers, a hair cut, pizza, can of cola, headphones.

Ask: How much do these things cost? Do they vary? Who decides on the price?

Encourage students to share their ideas.

Values

Ask: Have you ever negotiated the price of something? Encourage students to share their ideas and experiences. Then ask them to read the **Values** side bar about how negotiating is perceived in different cultures.

Warm-up

1 Ask students to discuss the three questions with a partner before asking a few pairs to share their ideas with the rest of the class.

2 Students look quickly at the three advertisements and decide what is for sale in each one. Ask a volunteer to provide the answers orally.

UNIT	CONTENT
1	Informing 1: Using English to share personal information
2	Expressing Opinion 1: Using English to express personal taste
3	Requesting 1: Using English to obtain goods and information
4	Explaining 1: Using English to provide reasons
5	Instructing 1: Using English to explain how to do something
6	Persuading 1: Using English persuasively
7	Informing 2: Using English to give practical information
8	Advising 1: Using English to share experiences
9	Complaining 1: Using English to express dissatisfaction
10	Instructing 2: Using English to make plans and give instructions
11	Negotiating: Using English for bargaining and compromise
12	Requesting 2: Using English to make formal requests
13	Explaining 2: Using English to explain complex ideas
14	Complaining 2: Using English to express ideals
15	Expressing Opinion 2: Using English to critique and review
16	Persuading 2: Using English to influence others
17	Advising 2: Using English to warn and prepare
18	Using English in the 21 st Century

You may also be interested in:

ENGLISH Ahead

Suitable for Pupils of English as a Second Language

Grade 7-9

Age 12-15

English Ahead is based on Cambridge Lower Secondary English as a Second Language Curriculum Framework (1110) for Stages 7, 8 and 9, while also drawing on other national syllabuses.

It aims to improve reading, writing, speaking and listening skills, build a rich vocabulary, and develop greater grammar accuracy. In addition, opportunities for discussion encourage students to think critically, and develop life-long learning skills.

This series will not go through the Cambridge International endorsement process.

The series is designed for students entering at CEFR Low B1 and exiting at CEFR low B2.



	CEFR
English Ahead 3	Low B2
English Ahead 2	B1
English Ahead 1	Low B1

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the MCE Cambridge
IGCSE™ Mathematics
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Cambridge IGCSE™ Mathematics

Core and Extended

and

Cambridge IGCSE™ & O Level Additional Mathematics

BROCHURE

**Beyond Basics,
Reimagine Education**

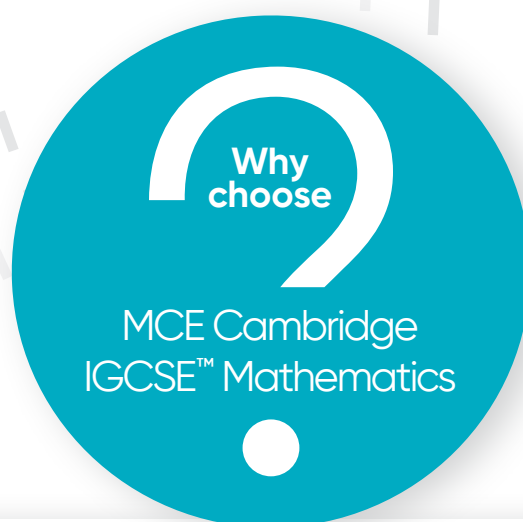
*We are working with Cambridge Assessment International
Education towards endorsement of this series.*

Overview

The **MCE Cambridge IGCSE™ Core and Extended Mathematics** and **MCE Cambridge IGCSE™ & O Level Additional Mathematics** series have been developed to deliver the latest Cambridge IGCSE and IGCSE (9–1) Mathematics syllabuses (0580/0980) and Cambridge IGCSE and O Level Additional Mathematics syllabuses (0606/4037) for examination from 2025. While the series are fully aligned to the Cambridge syllabuses, the pedagogies and teaching practices follow those used in Singapore – one of the top performing countries in international assessments such as Trends in International Maths and Science Study (TIMSS) and Programme for International Student Assessment (PISA).

Both series are anchored on the belief that all learners can learn and succeed in Maths regardless of their learning readiness. The series emphasise on developing learners' conceptual understanding and problem-solving skills, allowing them to eventually achieve mastery.

The series also comes complete with a comprehensive suite of print and digital resources that help the 21st century learners and teachers succeed.



1. Engage in motivating and meaningful learning experiences

2. Adopt the idea of “slow-thinking”

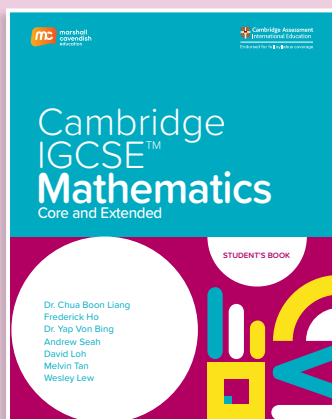
3. Experience a personalised practice pathway

What's in Our Package?

MCE Cambridge IGCSE™ Core & Extended Mathematics

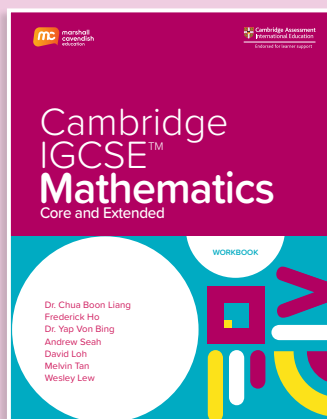
Student's Book

ISBN 9789814913065



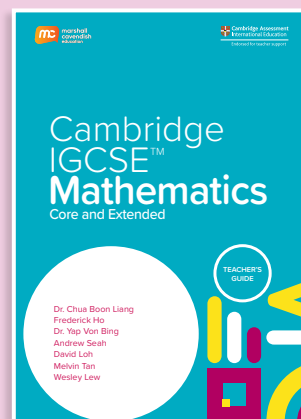
Workbook

ISBN 9789814913072



Teacher's Guide

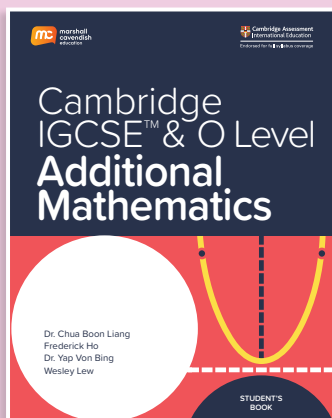
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MCE Cambridge IGCSE™ & O Level Additional Mathematics

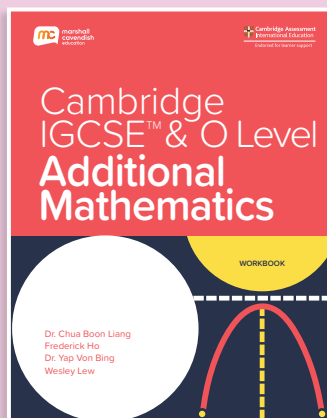
Student's Book

ISBN 9789814913096



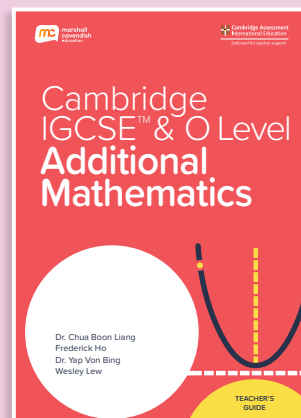
Workbook

ISBN 9789814913102



Teacher's Guide

ISBN 9789814913119



Additional Digital Resources*

- Annotatable eBooks
- Worked Solutions
- Editable Resources
 - Scheme of Work (SOWs)
 - Lesson Plans
- Question Bank
- AI-driven Personalised Learning Pathway

*These resources will not go through the Cambridge International endorsement process.

Every Learner can Learn and Succeed in Maths when They are Provided with Motivating and Meaningful Learning Experiences

Underpinning the **MCE Cambridge IGCSE™ Mathematics** series is the belief that every learner can learn Maths if they are motivated and given the opportunities to construct their own understanding and knowledge. For effective learning to take place, learners need to be provided with meaningful, engaging and stimulating learning activities for them to explore concepts and construct understanding. Learners must also be provided with opportunities to apply the concepts and skills learnt in real-world contexts, articulate their reasoning clearly and appreciate the power and beauty of mathematics.

For these reasons, our **MCE Cambridge IGCSE™ Mathematics** series have been written with a focus to create meaningful and engaging learning experiences that develop learners' conceptual understanding and problem-solving skills.

Engage with Relatable Contexts that Connect Maths to the Real World

CHAPTER

12

Binomial Theorem

Chapter Opener

To pique students' interest, each chapter begins with a Chapter Opener on a real-world problem that provides them with the rationale and motivation to learn.

The visuals help students see the link in Mathematics to the real-world problem, providing a sense of familiarity and making the real-world problem more relatable.

The discussion question prompts students to start thinking and get them engaged to learn.

When you save money in a bank, you are paid a yearly interest. Suppose the bank offers you an annual rate of 1% compound interest and you put \$500 into a saving account for a total of 10 years. The exact amount in your account after 10 years is $\$500 \times 1.01^{10}$. How would you get an approximate answer without the use of a calculator?

At the end of this chapter, you will learn how to:

- use the Binomial Theorem for expansion of $(a + b)^n$, for positive integer n
- use the general term $\binom{n}{r} a^{n-r} b^r$, $0 \leq r \leq n$

Recall and Review What They Know

Recall

To help students recall and revisit relevant pre-requisite concepts so that they can build on their existing schema and create new knowledge and learn new skills.

Chapter 12

Recall

- 1 Expand $a(b + c)$ and $(a + b)^2$.
- 2 Simplify $(a^m)^n$.
- 3 State $\binom{n}{r}$.
- 4 State $n!$.
- 5 State $0!$.

TAKE NOTE

$a^2 + 2ab + b^2$ has three terms: a^2 , $2ab$ and b^2 .
The coefficients of a^2 and b^2 are both 1 because $a^2 = 1a^2$ and $b^2 = 1b^2$.
The coefficient of ab is 2.

12.1 Binomial Expansion



Consider the identity $(a + b)^2 = a^2 + 2ab + b^2$.
The expression $(a + b)$ contains two terms, a and b , connected by a "+" sign.
An expression containing the sum of two terms is called a **binomial**.



Think

Is the expression $(a - b)$ a binomial? Why?
What are two other examples of a binomial?

In this section, we will learn to expand the cube and higher powers of binomials, for example, $(a + b)^3$, $(a + b)^4$, $(a + b)^7$ and $(a + b)^{10}$.
When we expand $(a + b)^n$, where n is a non-negative integer, we are multiplying the products of n binomials into a sum of terms. This expansion is known as a **binomial expansion**.
Let us now explore how we can expand $(a + b)^3$, $(a + b)^4$ and $(a + b)^5$.

Think and Make Observations, and Make Sense and Process New Knowledge and Skills

Pause and Discover

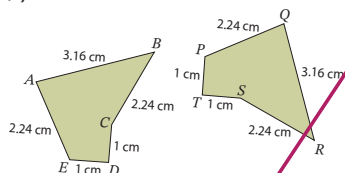
To sustain students' interest, students are provided opportunities to explore, discover, and construct new mathematical knowledge through scaffolded learning tasks found in Pause and Discover. Students will find these activities meaningful and engaging as they gain new knowledge and skills in the process of doing them.

PAUSE

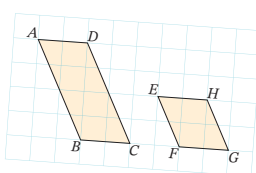
Try 1

Explain if the following pairs of figures are congruent.

(a)



(b)



Chapter 10

PAUSE

Discover

In this activity, you will learn to

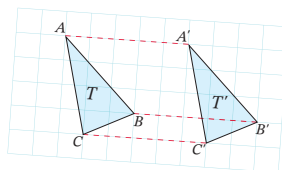
- determine if a triangle and its translated image are congruent.
- determine if a triangle and its reflected image are congruent.
- determine if a triangle and its rotated image are congruent.

1



Use a graphing software or grid paper to construct the two triangles T and T' .

Points A , B and C are each translated horizontally 3 units to the right to form triangle T' . The images of A , B and C are A' , B' and C' respectively.



- (a) $AB = A'B'$, $BC =$ and $AC =$
 $\angle A =$, $\angle B =$ and $\angle C =$

- (b) Are triangles T and T' congruent? Why or why not?

PAUSE

Think

Triangle T is transformed to T' by a translation. Will any triangle be congruent to its translated image?

The learning activities are scaffolded step-by-step.

Work on Practice Questions to Reinforce Concepts and Master New Procedural Skills

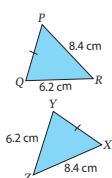
For students to master mathematical concepts, it is important that they are given sufficient guidance with clear explanations to learn through worked examples followed by practice of questions that are similar to these examples. Such practice should include repetition and variation, including questions to achieve proficiency and flexibility. Outside of the classroom, meaningful and appropriate amount of practice questions should be given to students to reinforce and consolidate their learning, as well as to deepen their understanding of concepts and skills.

MCE Cambridge IGCSE Core & Extended Mathematics Student's Book

Chapter 10

PAUSE Try 6

Prove that $\triangle PQR$ is congruent $\triangle XYZ$.

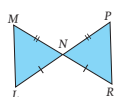


TAKE NOTE

The vertices of congruent triangles must be written in a corresponding order.

PAUSE Try 7

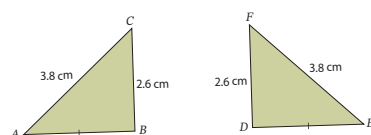
Prove that $\triangle LMN$ is congruent $\triangle PRN$.



Worked Example 6

(Prove two triangles are congruent using the SSS Congruency Test)

Prove that $\triangle ABC$ is congruent to $\triangle EDF$.



$$AB = ED \quad (\text{given})$$

$$AC = EF = 3.8 \text{ cm}$$

$$CB = FD = 2.6 \text{ cm}$$

$$\therefore \triangle ABC \equiv \triangle EDF \quad (\text{SSS})$$

Worked Example 7

(Prove two triangles are congruent using the SAS Congruency Test)

Prove that $\triangle GHL$ is congruent to $\triangle JKL$.



Student's Book Worked Examples

Carefully selected questions are presented with step-by-step solutions with clear explanations to help scaffold students' learning and understanding.

MCE Cambridge IGCSE & O Level Additional Mathematics Student's Book

Chapter 12

Worked Example 2

(Expand binomial with difference of two variables using Pascal's Triangle)

Expand $(a - b)^6$.

$$(a - b)^6 \text{ as } (a + (-b))^6.$$

Worked Example 1,

$$(a + b)^6 = a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$$

Using b in the expansion with $-b$, we get

$$(a - b)^6 = a^6 + 6a^5(-b) + 15a^4(-b)^2 + 20a^3(-b)^3 + 15a^2(-b)^4 + 6a(-b)^5 + (-b)^6.$$

re,

$$(a - b)^6 = a^6 - 6a^5b + 15a^4b^2 - 20a^3b^3 + 15a^2b^4 - 6ab^5 + b^6$$

Think

- Compare the two expansions of $(a + b)^6$ and $(a - b)^6$. What remains the same? What is different?
- Can you expand $(a - b)^6$ without using the expansion of $(a + b)^6$?

TAKE NOTE

$(-y)^2$ is **not** $-y^2$.
It is $(-y) \times (-y) = y^2$.
 $(-y)^3 = (-y) \times (-y) \times (-y) = -y^3$

Student's Book Pause and Try

Consists of questions that mirror questions in the worked examples to help students reinforce learning in class and achieve mastery of important procedural skills.

PAUSE Try 2

Using the expansion of $(a + b)^7$ in the **Pause and Try 1**, expand $(a - b)^7$.

Student's Book Exercise

Basic and Intermediate level questions are found in the exercises of the Student's Books.

Exercise 12.1

- Expand each of the following.
(a) $(c+2)^4$ (b) $(1-h)^6$ (c) $(3+p)^5$ (d) $(m-\frac{1}{2})^3$
- Find, in descending powers of x , the expansion of each of the following.
(a) $(2x+3)^5$ (b) $(3x^2-1)^4$ (c) $(\frac{x}{4}-2)^6$ (d) $(3x+\frac{1}{2})^5$
- Find, in ascending powers of y , the expansion of each of the following.
(a) $(3-y)^5$ (b) $(1+2y)^6$ (c) $(2+\frac{y}{3})^4$ (d) $(1-y^2)^3$
- The row of coefficients in the expansion of $(a+b)^n$ is
1, a , 55, b , 330, c , 462, d , 165, e , f , 1
Find the values of a, b, c, d, e, f and n . Explain clearly how you obtained each value.
- Expand each of the following.
(a) $(2a+3b)^4$ (b) $(c-\frac{1}{c})^5$
- Find the first four terms in the expansion of $(2+3y)^5$.
Hence, deduce the first four terms in the expansion of each of the following.
(a) $(2-3y)^5$
(b) $(2+3y^2)^5$
- (a) Expand $(2-p)^6$.
(b) Find, in ascending powers of p , the first three terms in the expansion of $(2+p)(2-p)^6$.
(c) Find the coefficient of p^3 in the expansion of $(1-\frac{2}{p})(2-p)^6$.
- Find the first four terms of the expansion of $(1-3x)^6$ in ascending powers of x .
(a) If the expansion in (a) were to be used to approximate the value of $(0.97)^6$, what would be a suitable value of x to take?
(b) By substituting the value of x obtained in (b) into the expansion in (a), find an approximate value of $(0.97)^6$.

Basic Level

Intermediate Level

Review Questions

- After John had expanded $(a+1)^6$ into a sum of terms, he made three observations. State whether each of his observations is true or false. If his observation is false, provide the correct answer.
(a) There are 6 terms in the sum.
(b) The coefficients of the terms are 1, 6, 15, 15, 6, 1.
(c) $6a$ and $6a^5$ are two terms in the sum.
- Susan made the following two observations about the expansion of $(c-2)^9$. State whether each of her observations is true or false. If her observation is false, provide the correct answer.
(a) The 2nd term in the expansion is $-9c$.
(b) The 5th term in the expansion is $\binom{9}{5}c^4(-2)^5$.
- The row of coefficients in the expansion of $(a+b)^7$ is 1, 7, 21, 35, 35, 21, 7, 1. Write down the row of coefficients in the expansion of each of the following.
(a) $(a+b)^8$
(b) $(a+b)^9$
- The expansion of $(2+3x)^6$ using the Binomial Theorem is shown below.
Fill in the boxes and then simplify the terms.
$$(2+3x)^6 = 1(2)^6 + \boxed{}(2)^5(3x) + 15(2)^{\boxed{}}(3x)^2 + \boxed{}(2)^3(3x)^3 + 15(2)^{\boxed{}}(3x)^4 + \boxed{}(2)^{\boxed{}}(3x)^5 + 1(3x)^6$$
- (a) Using the formula $\binom{n}{r} = \frac{n!}{r!(n-r)!}$, evaluate each of the following.
(i) $\binom{n}{0}$ (ii) $\binom{n}{n}$
(b) Hence, write down a relationship connecting $\binom{n}{0}$ and $\binom{n}{n}$.
(c) Draw the Pascal's Triangle for $n = 0, 1, 2, 3, 4$ and 5, circle the locations of $\binom{n}{0}$ and $\binom{n}{n}$ as n goes from 0 to 5.

Student's Book Review Questions

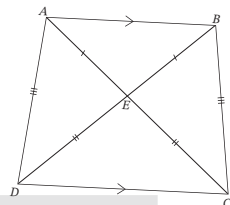
A consolidated list of questions at the end of the chapter to help students combine their understanding of concepts and mastery of procedural skills.

S

Further Exercise

10.2 Congruency Tests

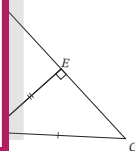
- 1 In the diagram, $ABCD$ is a quadrilateral. The diagonals AC and BD intersect at E . $AE = BE$, $DE = CE$, $AD = BC$ and $AB \parallel DC$. Name two pairs of congruent triangles and state the reason of congruence.



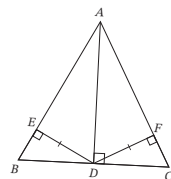
Workbook Further Exercise

Questions that require higher-order thinking skills are found in the further exercises of the Workbook.

- 2 ABC is a triangle. P is the midpoint of BC and $\angle BAC = 84^\circ$. D and E lie on AB and AC respectively such that $\angle BEP = \angle CEP = 90^\circ$ and $PD = PE$. Find $\angle EPC$.



- 3 In the diagram, ABC is a triangle. E and F lie on AB and AC respectively such that DE is perpendicular to AB and DF is perpendicular to AC . AD is a perpendicular bisector to BC . Given that $DE = DF$, explain why the areas of $\triangle BDE$ and $\triangle CDF$ are equal.



Workbook Chapter Opener Revisit

Prompts students to look back and solve the problem in the Chapter.

Chapter 10

Chapter Opener Revisit

Let's take a look at the original questions in the Chapter Opener of the Student Book:

An architect wants to create a blueprint for a square piece of land to build a resort. The resort consists of a hotel building, a theme park, a shopping arcade and a swimming pool. He comes up with two proposals on how to divide the land to build the facilities.

Proposal 1: The land is cut into two identical rectangles and two similar squares, which areas are in the ratio 4 : 1.

Proposal 2: The land is cut into four identical quadrilaterals that are not rectangles or squares. How would you decide if the proposals are feasible?

Chapter 12

Fun with Maths!

You have learnt two methods of expanding $(a + b)^n$ by applying the Pascal's Triangle, and the Binomial Theorem. You will now learn another interesting method for binomial expansion.

Here are the steps for expanding $(a + b)^n$:

- Step 1:** The first 1st term is a^n .
Step 2: The coefficient of the second 2nd term is n and its variable component is $a^{n-1}b$.
Step 3: For each subsequent term, its coefficient can be found using the formula:

$$\frac{\text{Coefficient of the previous term} \times \text{Power of } a \text{ of the previous term}}{\text{Position of the previous term in the expansion}}$$

Its variable component can be derived from the decreasing powers of a and the increasing powers of b .

- Step 4:** The last term is b^n .

To expand $(a + b)^6$, note that there are 7 terms in the expansion of $(a + b)^6$.

Step 1	The 1st term is a^6 .
Step 2	The coefficient of the 2nd term is 6. The variable component is a^5b . So, the 2nd term is $6a^5b$.

MCE Cambridge IGCSE & O Level Additional Mathematics Workbook

Workbook Fun with Maths!

Provides activities that extend students' creative thinking skills and learning.

Monitoring Their Own Learning

MCE Cambridge IGCSE & O Level Additional Mathematics Student's Book

Chapter 12

Review

Put a tick if you are able to do the following tasks.

Learning Outcomes	I can do the following:	✓
Use Pascal's Triangle for expansion of $(a + b)^n$, for positive integer n .	1. Write out the coefficients of the terms in the expansion of $(a + b)^n$, for n up to 10, using Pascal's Triangle.	<input type="checkbox"/>
	2. Expand $(a + b)^n$ using Pascal's Triangle.	<input type="checkbox"/>
Use the Binomial Theorem for expansion of $(a + b)^n$, for positive integer n .	1. State $n! = n \times (n - 1) \times (n - 2) \times \dots \times 3 \times 2 \times 1$ for any positive integer n .	<input type="checkbox"/>
	2. State $\binom{n}{r} = \frac{n!}{r!(n-r)!}$, where n is a non-negative integer and r is an integer such that $0 \leq r \leq n$.	<input type="checkbox"/>
	3. Recognise five observations about the expansion of $(a + b)^n$: (i) There are $n + 1$ terms in the expansion. (ii) The power of a starts with n and decreases to 0. The power of b starts with 0 and increases to n . (iii) The coefficient of the 2nd term is always n . (iv) The coefficients of the terms are symmetrical. (v) The sum of the powers of a and b in each term is always n .	<input type="checkbox"/>
	4. Apply the following: $(a + b)^n = \binom{n}{0}a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \binom{n}{3}a^{n-3}b^3 + \dots + \binom{n}{r}a^{n-r}b^r + \dots + \binom{n}{n-1}ab^{n-1} + \binom{n}{n}b^n$ where n is a non-negative integer.	<input type="checkbox"/>

Student's Book Review

Provides a checklist that helps students evaluate and monitor their mastery of the mathematical concepts and skills.

Learning can be Enhanced when Learners are Given Opportunities to Practise “Slow-Thinking”

For effective learning to take place, the learning of mathematics must go beyond the memorisation of facts and procedures. Instead, a greater emphasis should be placed on developing the learners conceptual understanding and problem-solving skills.

The series adopts the idea of “slow thinking” to provide students with sufficient time and opportunities at important junctures during learning activities to understand the why, and not just the what and how behind the mathematical definitions, formulae, rules, and procedures. Knowing the why empowers students to learn the new maths concepts and skills.

Such an approach enhances the students’ learning experiences as well as deepen their conceptual understanding. This helps keep students motivated and engaged throughout the process of learning and hone their metacognition skills, which is an important 21st century skill that forms one of the key components in the Singapore Mathematics Curriculum Framework.

Here are examples of how students can practise “slow-thinking” in the series.

MCE Cambridge IGCSE & O Level Additional Mathematics Student's Book

Chapter 12

PAUSE Discover

In this activity, you will learn to

- expand $(a + b)^n$ for $n = 3, 4$ and 5.
- make five observations about the expansions.
- use the five observations to write the expansion of $(a + b)^n$.
- use Pascal's Triangle to expand $(a + b)^n$.

1(a) Expand $(a + b)^3$.

$$\begin{aligned}(a + b)^3 &= (a + b)(a + b)^2 \\ &= (a + b)(a^2 + 2ab + b^2) \\ &= a(a^2 + 2ab + b^2) + b(a^2 + 2ab + b^2) \\ &= a^3 + 3a^2b + ab^2 + b^3\end{aligned}$$

(b) Expand $(a + b)^4$.

$$\begin{aligned}(a + b)^4 &= (a + b)(a + b)^3 \\ &= (a + b)(a^3 + 3a^2b + ab^2 + b^3) \quad \text{Hint: Use the expansion of } (a + b)^3 \text{ above.} \\ &= a(a^3 + 3a^2b + ab^2 + b^3) + b(a^3 + 3a^2b + ab^2 + b^3) \\ &= a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4\end{aligned}$$

PAUSE Think

How can you expand $(a + b)^n$ using $(a + b)^2$ instead? Which method do you prefer? Why?

(c) Expand $(a + b)^5$. Show clearly how you did it.

TAKE NOTE

Distributive Law

The expansion of $(a + b)Y$ is $aY + bY$.

$$\begin{aligned}\text{If } Y &= (a + 1), \text{ then} \\ (a + b)(a + 1) &= a(a + 1) + b(a + 1)\end{aligned}$$

$$\begin{aligned}\text{If } Y &= (a + c + 1), \text{ then} \\ (a + b)(a + c + 1) &= a(a + c + 1) + b(a + c + 1)\end{aligned}$$

Pause and Discover

Students are guided through scaffolded learning tasks in Pause and Discover, where they are given sufficient time to construct new knowledge.

Pause and Think

At appropriate junctures, guiding questions found in Pause and Think prompt students to think about and focus on key ideas. This develops and hones students’ metacognition.

Pause and Try

Students devote time to formative assessments that are found in Pause and Try so that timely feedback on students’ learning can be provided.

PAUSE Try 3

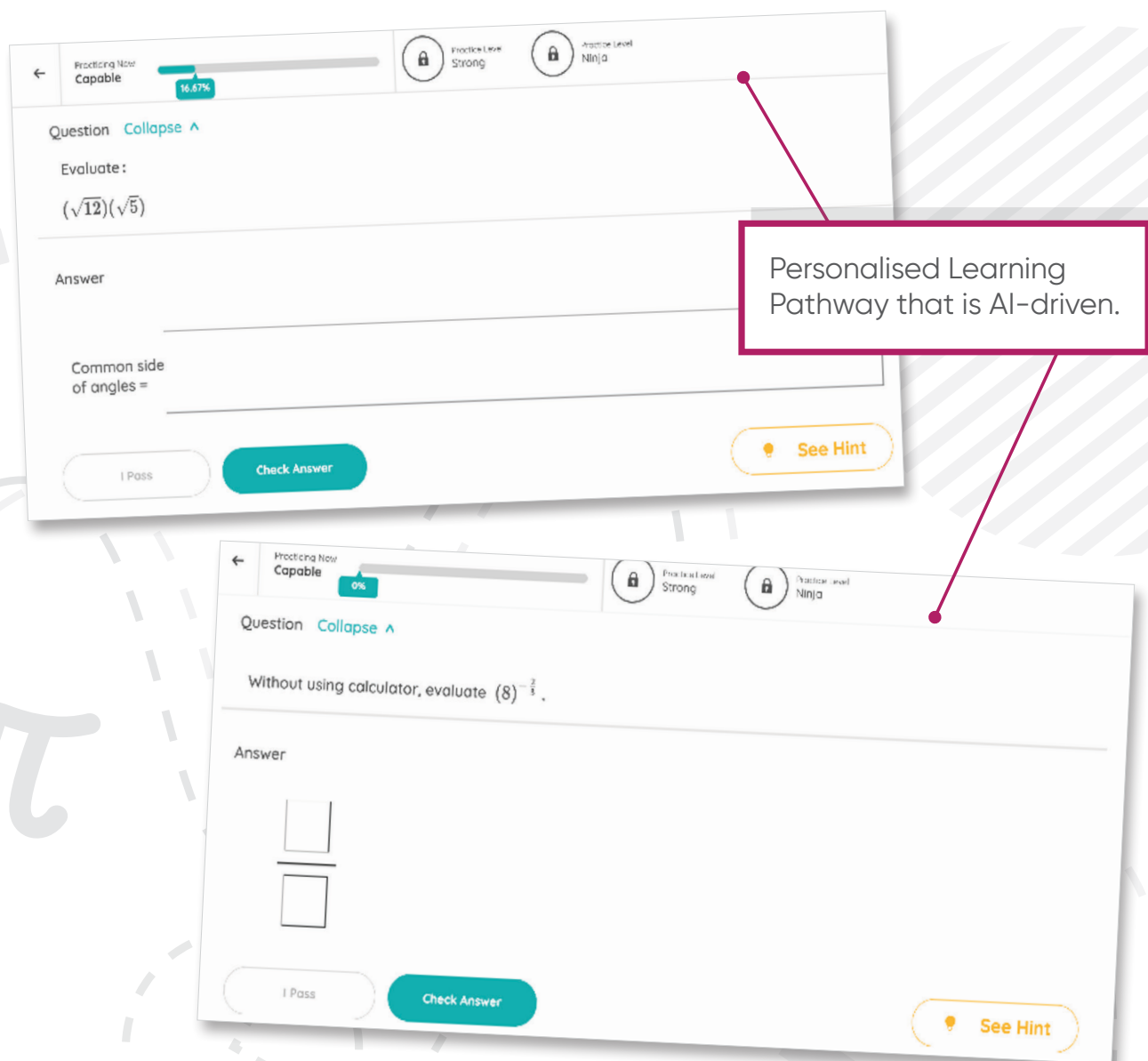
Expand $(a + 3)^4$.

Every Learner can be a Self-Directed Learner through a Personalised Practice Pathway

Different learners bring with them a wide range of knowledge, skills, and experiences. It is important to recognise this diversity and acknowledge that no two learners are alike. To cater to their diverse learning needs, our series aim to make the learning and practicing of mathematics concepts and skills more personalised. Using an AI-driven software*, our series has incorporated a personalised practice pathway to help every student attain Mathematical mastery.

As a student attempts the practice questions, the AI engine monitors the student's progress, providing immediate feedback and depending on whether the student answers correctly or incorrectly, generates questions based on the student's current readiness level.

The software will automatically adjust the level of the question to cater to the progress and performance of the student. Regardless of the student's readiness level, this pathway is AI-driven to allow every student to progress independently through a series of questions of progressive difficulty levels and become self-directed learners.



*This resource will not go through the Cambridge International endorsement process.

Every Teacher can Facilitate Effective Learning through the Comprehensive Suite of Resources

The post-covid world has changed the way lessons can be carried out. Regular lessons are now not limited to being carried out within the confines of a physical classroom in schools, they can also be carried out through home-based learning. In certain cases, hybrid lessons are being carried out with some students attending lessons in person.

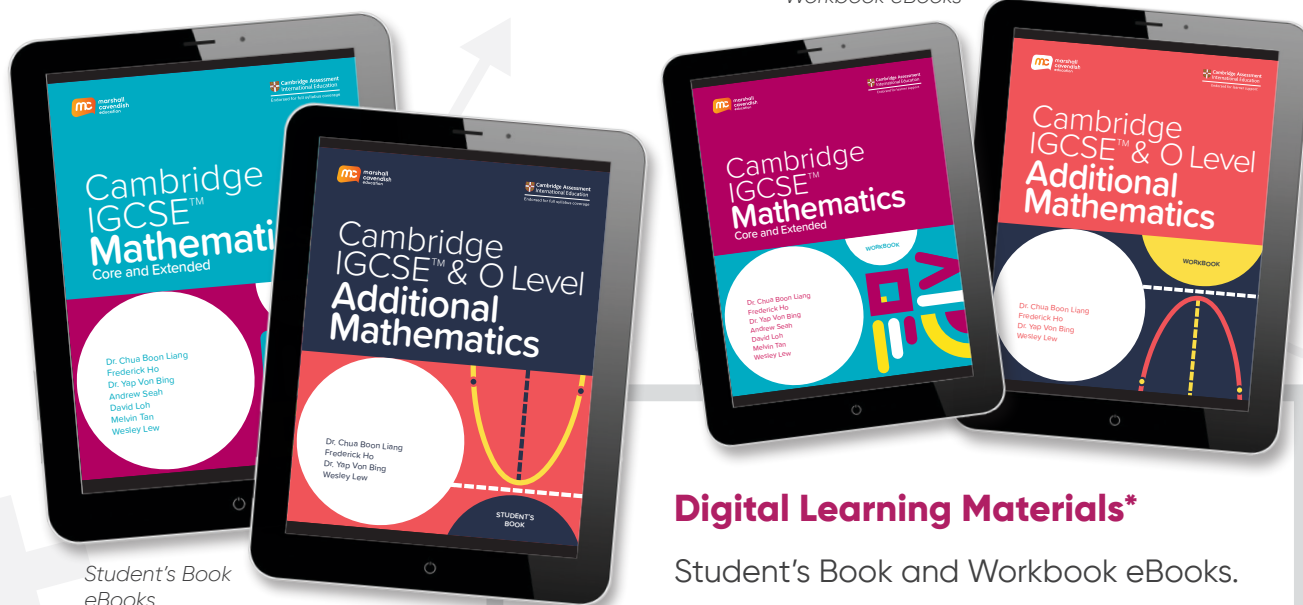
Our series provides a comprehensive solution for both teachers and students in the various learning and teaching scenarios. It comes complete with both print and digital Student's Books, Workbooks and Teacher's Guides, for use in the physical and online classrooms.

For Students

The suite of digital learning materials* includes the Student's Book and Workbook eBooks. These eBooks are annotatable so that students can scribble, take notes, or write their answers and save them for viewing later. Within the Student Book eBook, digital resources such as the interactive software (GeoGebra) and the Personalised Learning Pathway are tagged at the point of use.

The Personalised Learning Pathway is AI-driven and caters to the needs of every student. As the AI-driven practice questions come with immediate feedback, this functionality allows every student to progress independently without the need for frequent teacher intervention. Students are then able to become independent self-directed learners without being overly reliant on teacher's help.

Workbook eBooks



Student's Book eBooks

Digital Learning Materials*

Student's Book and Workbook eBooks.

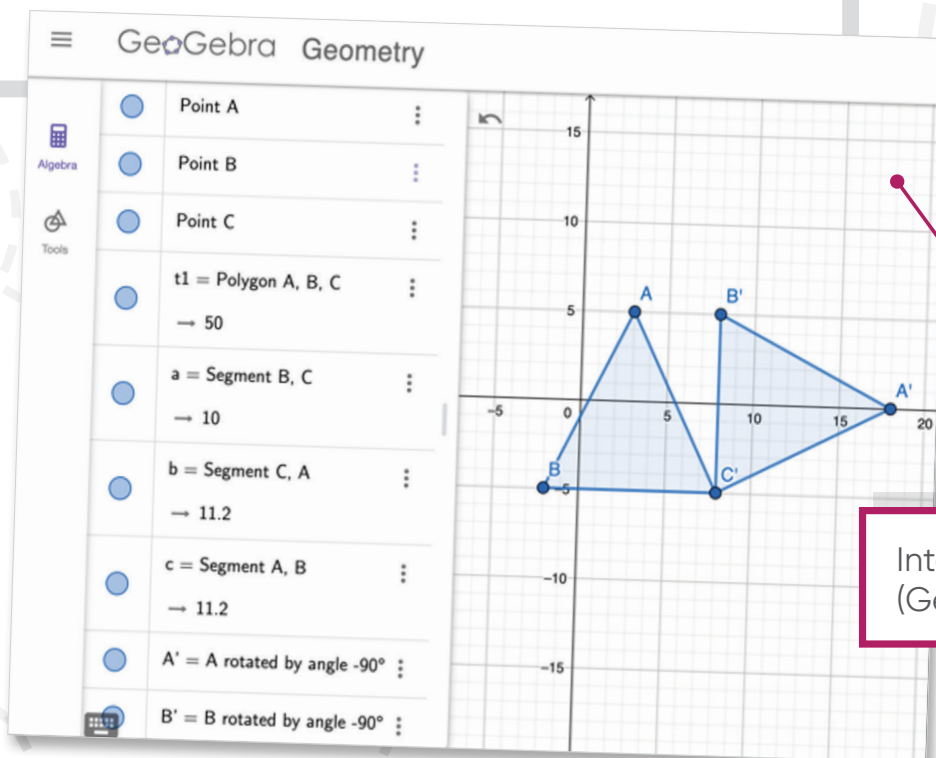
Our digital resources are available on



*These resources will not go through the Cambridge International endorsement process.

Suite of Digital Learning Resources*

Embedded within the eBooks, tagged at point of use.



Interactive Software
(GeoGebra)

Personalised Learning Pathway that is AI-driven provides practice questions with hints, auto-grading and feedback.

The screenshot shows a digital learning interface. At the top, there are two practice levels: 'Practice Level Strong' and 'Practice Level Ninja'. Below them, a 'Hint' box displays the expression $(\sqrt[3]{x})(\sqrt[3]{y}) = \sqrt[3]{xy}$. A feedback pop-up window is open, showing 'Oops.. incorrect!' and a 'Next Question >' button. The pop-up also shows the question, the user's answer, and the correct answer: $(\sqrt{12})(\sqrt{5})$. At the bottom of the pop-up, there is a 'Did you find the solution helpful?' section with icons for thumbs up, heart, share, and star, all with a count of 0. A 'See Hint' button is also visible in the background interface.

*These resources will not go through the Cambridge International endorsement process.

For Teachers

Besides the Student's Book and Workbook eBook (Teacher's Edition), the suite of digital teaching resources* also includes the editable SOW, Lesson Plans, Worked Solutions for the Student Book and Workbook as well as the Question Bank.

The digital teaching resources allow for flexibility and customisation depending on the needs of the students. Additionally, teachers have a teacher's account to the Personalised practice pathway to track and monitor students' progress. These resources are aimed to help teachers reduce their time and workload in lesson preparation and are easily accessible via the portal, anytime and anywhere.

Suite of Digital Teaching Resources*

The Teacher's Guide consist of Scheme of Work, Lesson Plans, Worked Solutions and Question Bank.

Teacher's Guide

0580 Chapter X: Congruence and Similarity

Scheme Of Work (SOW)

The SOW here is a very general one, providing teachers with some guidelines and teaching approaches so that teachers can adapt to suit their students' learning profiles.

Section	Key concepts/skills	Suggested length of time	Remarks/Activities
Chapter opener & introduction	- Congruence and similarity exist in real life	5 mins	Silent reading followed by a quick discussion of any simplest way of dividing the land in the 4 equal parts.
X.1: Congruence <u>In</u> Geometry			
X.1.1 Core C4.1 and C4.5)	- Idea of Congruence - Three geometrical transformations that give	About <u>70 mins</u>	- Teacher to print hard copies of appendix before the lesson - Either teacher or students can summarise the key result before

Scheme of Work (SOW)*

Help teachers in lesson preparation by outlining all the learning requirements and the suggested teaching periods or lessons.

*These resources will not go through the Cambridge International endorsement process.

LESSON 1**Warm-up****Chapter Opener [p. X]**

Draw students' attention that the topic on sequences and series is closely applicable to our daily life. We can use what we have learnt to analyse interest rate and different types of sport training programme so that we have a better insight on what is the best for us.

Ask: How would you decide which training programme is best? Will the initial distance affect the training plan?

Lesson Plans*

Introduce key mathematical concepts with lesson suggestions and ideas, to help teachers deliver lessons effectively and efficiently.

ited in the Workbook under Chapter Opener Revisit.

apter:

ometric progressions (sequences)

term and for the sum of the first n terms to solve problems

ometric progressions

vergence of a geometric progression, and the formula

for the sum to infinity of a convergent geometric progression

Recall [p. X]

Ask students to attempt the diagnostic questions on the opening page of the chapter.

[Answers at [MCEduHub](#)]

Worked Solutions for Textbook Exercise Questions

Chapter 1
Quadratic Functions**Worked Solutions for Textbook Exercise Questions****Exercise 1.1**

1 (i) $f(x) = 2x^2 + 1$
 $f(3) = 2(3)^2 + 1 = 19$

(ii) $f(-2) = 2(-2)^2 + 1 = 9$

(iii) For all real values of x , $x^2 \geq 0$
 $2x^2 \geq 0$
 $2x^2 + 1 \geq 1$
 $f(x) \geq 1$

2 (a) $x^2 + 12x = x^2 + 12x + 6^2 - 6^2$
 $= (x + 6)^2 - 36$

(b) $x^2 - 4x + 1 = x^2 - 4x + 2^2 - 2^2 + 1$
 $= (x - 2)^2 - 4 + 1$
 $= (x - 2)^2 - 3$

Chapter 1 Quadratic Functions

$$= -2\left(x - \frac{5}{4}\right)^2 + \frac{25}{8} + 3$$

$$= -2\left(x - \frac{5}{4}\right)^2 + \frac{49}{8}$$

3 (a) $f(x) = (x + 1)^2 - 7$
For all real values of x , $(x + 1)^2 \geq 0$
 $(x + 1)^2 - 7 \geq -7$
The minimum value of $f(x)$ is -7 .
When $f(x)$ is minimum, $x + 1 = 0$
 $x = -1$

(b) $f(x) = -(x - 1)^2 + 4$
For all real values of x , $(x - 1)^2 \geq 0$
 $-(x - 1)^2 \leq 0$
 $-(x - 1)^2 + 4 \leq 4$
The maximum value of $f(x)$ is 4 .
When $f(x)$ is maximum, $x - 1 = 0$
 $x = 1$

Worked Solutions*

Provide the answers and full worked solutions to the questions found in the Student's Book and the Workbook to assist teachers in the marking of students' assignment and homework

*These resources will not go through the Cambridge International endorsement process.

Question Bank

Chapter 17 Applications of Integration

Chapter 17

Applications of Integration

Question Bank

Basic

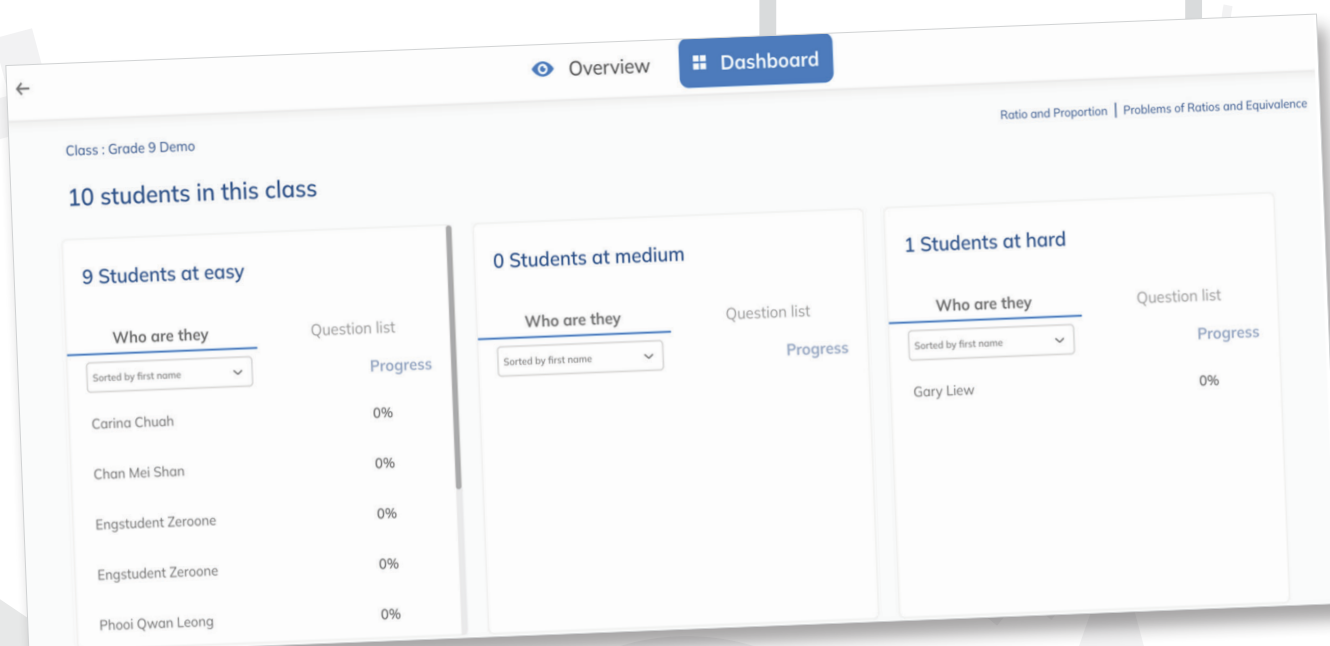
- Evaluate the following definite integrals.
 - $\int_{-1}^1 (2x^3 - 6x + 3) dx$
 - $\int_1^2 (x^2 - 3)^2 dx$
- Evaluate the following definite integrals.
 - $\int_e^{e^2} \frac{1}{x} dx$
 - $\int_e^{5e} \frac{1}{2x - e} dx$
- Evaluate the following definite integrals, giving your answer in 3 significant figures.
 - $\int_0^1 (e^x - 2e^{-x})^2 dx$
 - $\int_{-1}^1 \frac{e^{2x+3} + 2}{e^x} dx$

Question Bank*

Consists of questions with different difficulty levels for teachers to adapt and customise for assessment purposes.

Teacher Dashboard*

To monitor and track student's progress.



*These resources will not go through the Cambridge International endorsement process.

Other Products

You may also be interested in:

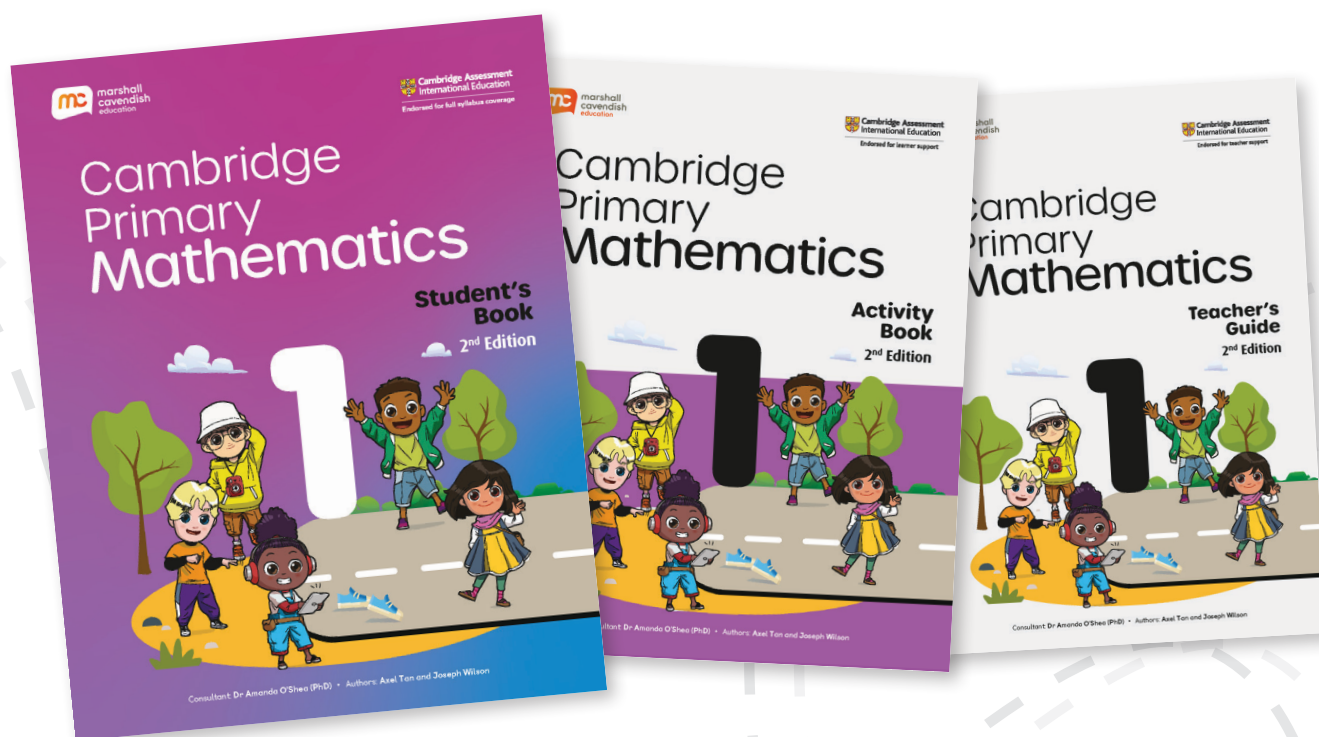


Scan here to learn more!



Cambridge Primary Mathematics

Grade 1 - 6 | Age 7 - 12



The Marshall Cavendish Education (MCE) Cambridge Primary Mathematics (2nd Edition) series is designed to support educators and learners following the Cambridge Primary Mathematics curriculum framework (0096). Our package nurtures active learners, using the Concrete-Pictorial-Abstract (CPA) approach helping them develop conceptual understanding.

The series draws on Singapore's tried and tested methodologies that focus on mastery through sequencing of concepts. Through activities that promote engagement, curiosity, innovation and reflection, learners are encouraged to become more confident and self-directing. Incorporating the new Thinking and Working Mathematically skills, the series develops learners as 21st century mathematical thinkers within a globalised community.

MATHS Ahead

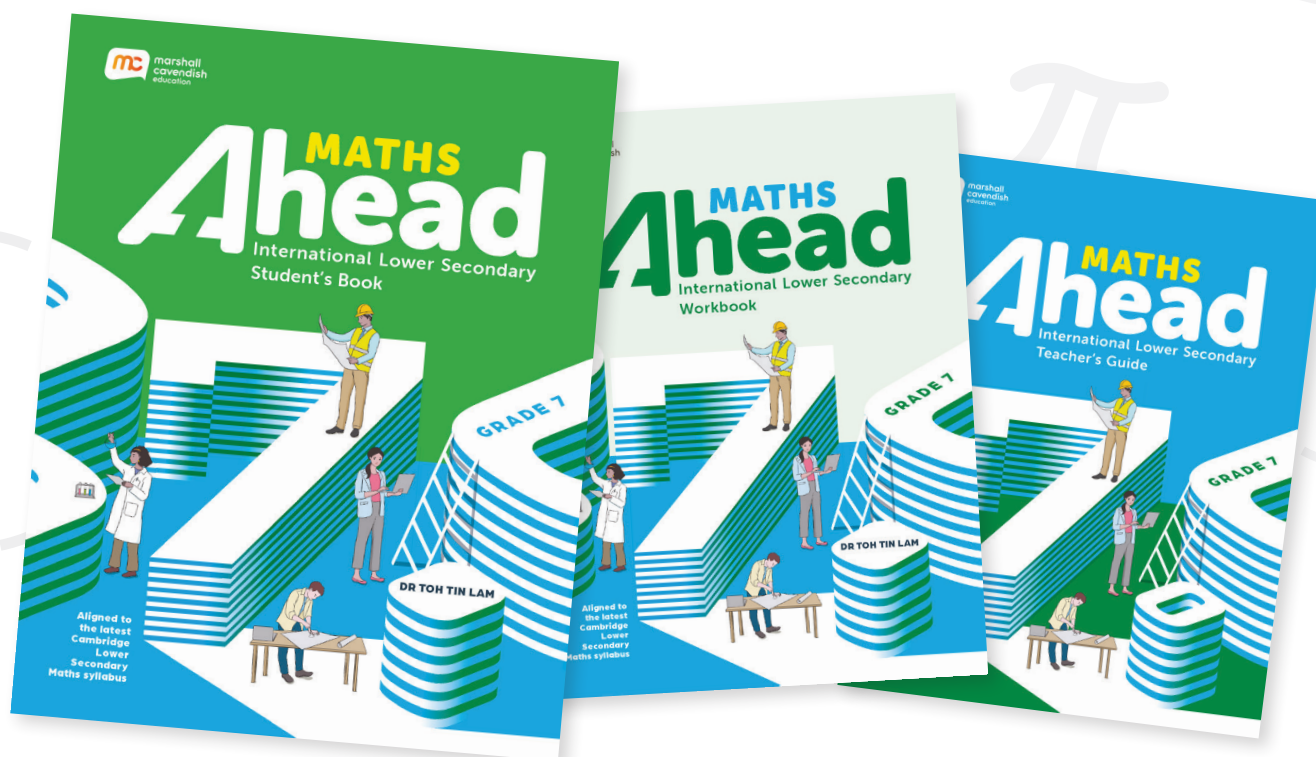
Grade 7 - 9 | Age 13 - 15

Scan here to learn more!



The Marshall Cavendish Education Maths Ahead Series is designed for students from Grades 7 to 9. Focused on building up necessary mathematical knowledge, this series comprises a Student's Book, Workbook, Teacher's Guide, and digital resources for each level.

The Maths Ahead Package espouses the use of comics to enhance students' learning for the development of the 21st century competencies in the Mathematics classroom.



Based on the paper co-written by Dr Toh Tin Lam and other writers, the use of comics in our student book aims to empower learners through the following:

- Capture Interest and impress key mathematical ideas
- Enhance and extend communication of Maths concepts to facilitate understanding
- Minimise apprehension and anxiety by Increasing motivation to learn Mathematics
- Provide a bridge between Maths concepts and real-life context
- Engage and encourage students to participate actively in class discussions and collaboration



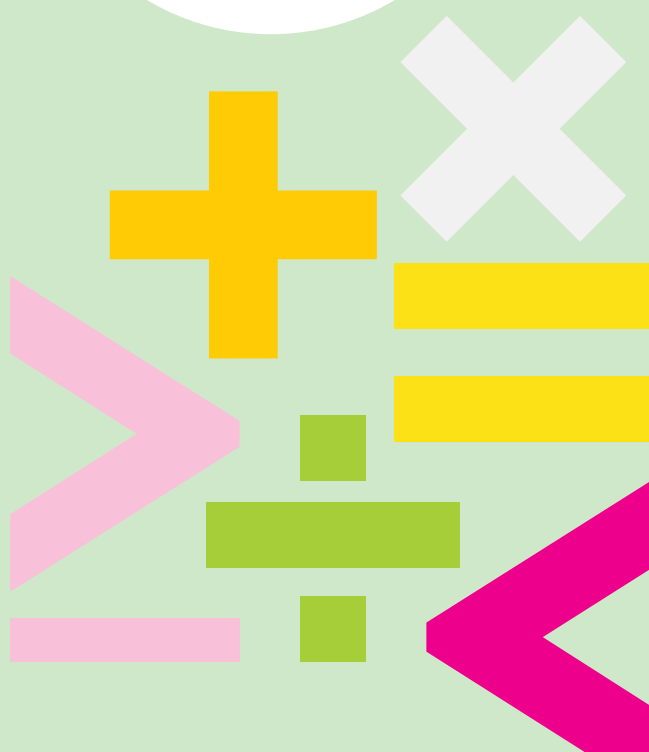
Scan here to access
the MCE Cambridge
Lower Secondary
Mathematics website

Cambridge Lower Secondary Mathematics

BROCHURE

**Beyond Basics,
Reimagine Education**

*We are working with Cambridge Assessment International
Education towards endorsement of this series.*



Overview

The **MCE Cambridge Lower Secondary Mathematics** package has been developed for schools that follow and deliver the Cambridge Lower Secondary Mathematics curriculum framework (0862). While the series is fully aligned to the Cambridge curriculum framework, the pedagogies and teaching practices follow those used in Singapore, one of the top performing countries in international assessments such as Trends in International Maths and Science Study (TIMSS) and Programme for International Student Assessment (PISA).

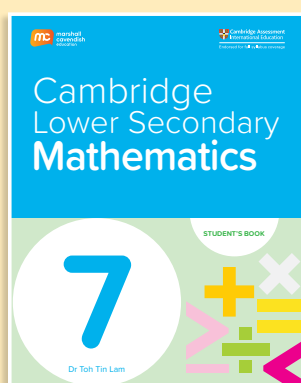
The series is written based on the belief that every student can succeed in Mathematics regardless of their English language proficiency and learning readiness. It emphasises on the development of students' conceptual understanding and procedural skills through analysis and reasoning, mathematical discussions and problem-solving, enabling them to achieve mathematical mastery.

This series comes complete with a comprehensive suite of print and digital resources that help 21st century learners and teachers succeed.

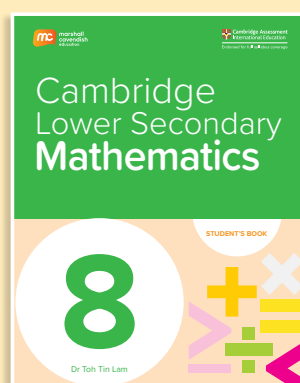
What's in Our Package?

Student Book

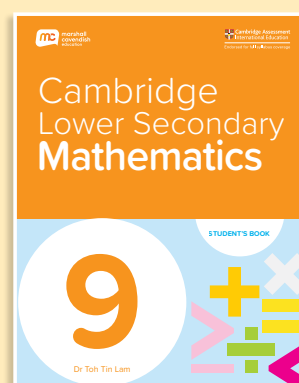
Print and eBook (with access to personalised digital assessment)



Stage 7
ISBN 9789815090390



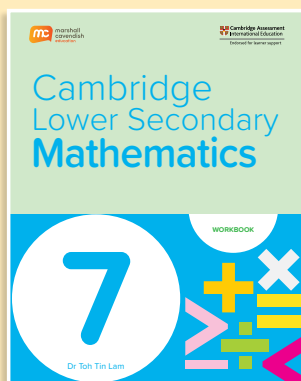
Stage 8
ISBN 9789815090406



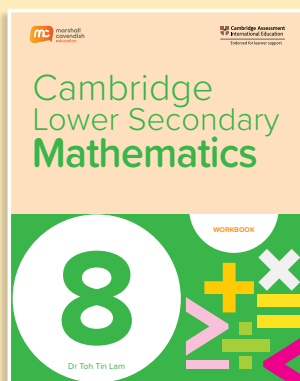
Stage 9
ISBN 9789815090413

Workbook

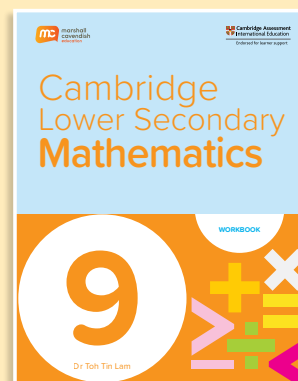
Print and eBook



Stage 7
ISBN 9789815090420

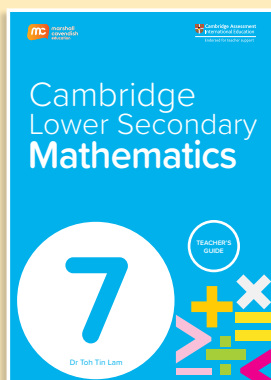


Stage 8
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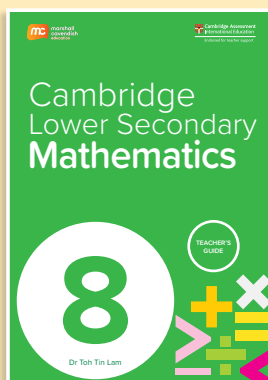


Stage 9
ISBN 9789815090444

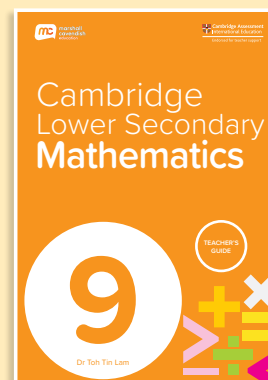
Teacher's Guide



Stage 7
ISBN 9789815090451



Stage 8
ISBN 9789815090468



Stage 9
ISBN 9789815090475

Additional Digital Resources*

Available on  EduHub

- Editable Lesson Plans
- Downloadable SOWs in Word
- Question Bank for each chapter in Word
- Student eBook
- AI-Driven Personalised Digital Assessment
- Virtual Manipulatives (VM)

*These resources will not go through the Cambridge International endorsement process.



Why
choose

MCE Cambridge
Lower Secondary
Mathematics

1. Engages students and minimises their apprehension in learning Mathematics using comics

2. Encourages guided inquiry, active learning, and the development of 21st century competencies through a student-centred approach that incorporates the Thinking and Working Mathematically strand throughout the entire series

3. Allows for Personalised Digital Assessment using AI* and self-directed learning

**These resources will not go through the Cambridge International endorsement process.*

Engaging Students and Minimising Their Apprehension in Learning Mathematics Using Comics


Based on the research paper: 'Use of comics to enhance student's learning for the development of the twenty-first century competencies in the mathematics classroom', comics provide a motivating and engaging learning experience. The use of comics in the teaching packages was shown to be effective in capturing students' interest to learn by minimising their anxiety and increasing their motivation.

This series incorporates comics to bridge the gap between the abstract Maths concepts and real-world contexts so that students will be able to better appreciate and understand the application of Maths.

Comics capture interest and impress key mathematical ideas.



Grade 7 Student Book p.364

Thinking and Working Mathematically (TWM) skills are integrated throughout the learning and practice, and are marked with the TWM star .

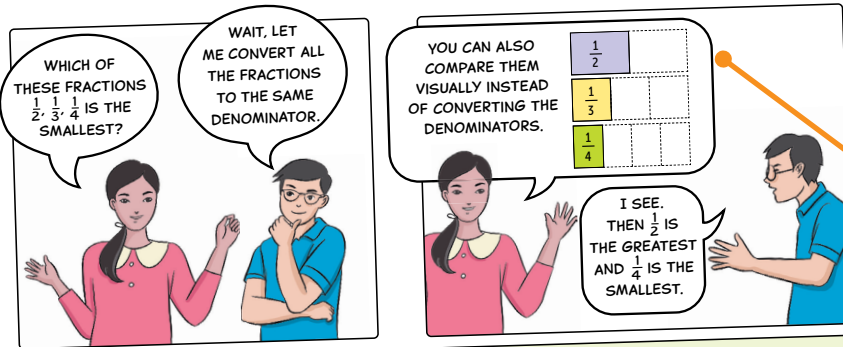


Grade 8 Student Book p.75

Comics set the stage to engage and encourage students to participate and collaborate actively in class discussions through **Discuss**.

Grade 7 Student Book p.47

Comparing Fractions with the Same Numerator



Think

Without converting all the fractions to the same denominator, can you tell which are the greatest and smallest fractions? $\frac{2}{5}$, $\frac{2}{7}$, $\frac{2}{10}$, $\frac{2}{19}$

Comics facilitate conceptual understanding by unpacking Maths concepts.

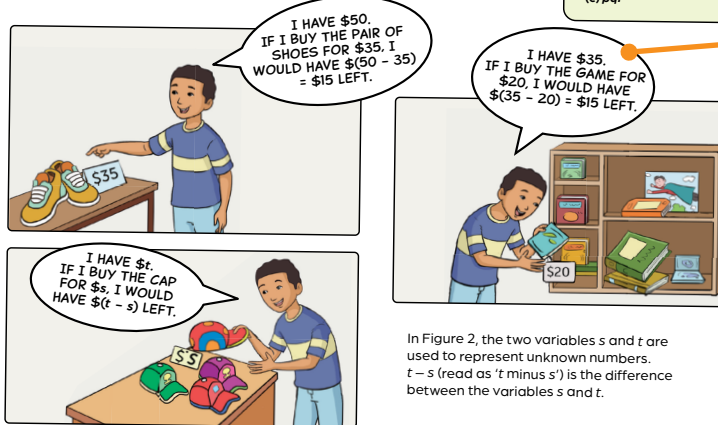


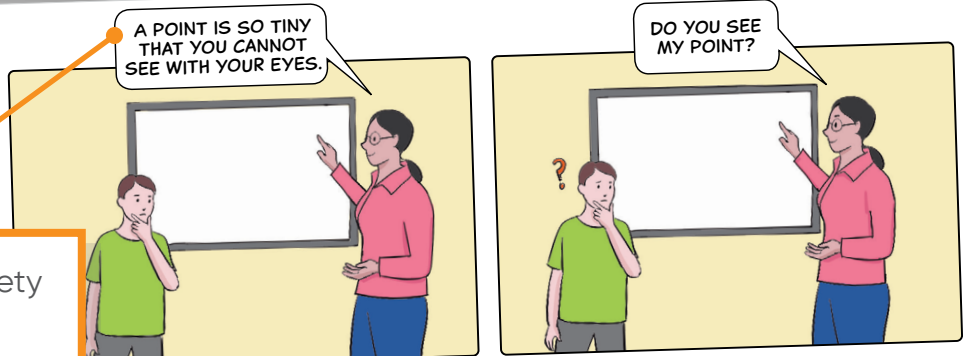
Figure 2

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ALGEBRA 137

Grade 7 Student Book p.284

Grade 7 Student Book p.137



Comics minimise anxiety by showing students how mathematical terms are used in real-world contexts, giving them the confidence to communicate using mathematical language.

Parallel Lines



Can you identify the pair of lines parallel to each other?

Grade 7 Student Book p.293

Grade 7 Student Book p.1

CHAPTER 01 Numbers

LET'S EXPLORE!

- 1.1 Integers and Place Value
- 1.2 The Four Operations
- 1.3 Whole Numbers
- 1.4 Divisibility Tests
- 1.5 Squares and Square Roots
- 1.6 Cubes and Cube Roots

IN A COOL TEMPERATE COUNTRY, THE TEMPERATURE IN SPRING CAN BE AT A COMFORTABLE 10°C TO 20°C .

I NEED TO BE WHERE SHE'S AT...

12°C

Sam

-12°C

BRRRRR!!!

Sarah

DISCUSS

Even though both temperatures shows 12°C , why do you think Sam seems to be feeling comfortable while Sarah is freezing?

NUMBERS 1

Comics provide a bridge between Maths concepts and real-world contexts to raise students' global awareness.

Grade 7 Student Book p.265

If you trained hard for a competition, you are likely to perform well on that day.

It is unlikely to see hailstorms in Indonesia.

Encouraging Guided Inquiry, Active Learning, and the Development of 21st Century Competencies through Student-Centred Learning Activities

For effective learning to take place, learners need to be provided with meaningful, engaging, and stimulating learning activities for them to explore concepts and construct understanding. These learning activities in the series provide students with opportunities to apply concepts and skills such as Thinking and Working Mathematically (TWM), communication, collaboration, creative and critical thinking. It is designed to grow self-directed learners and develop their 21st century competencies.

Engage in Discussions Using Real-World Contexts

LET'S EXPLORE!

CHAPTER 02 Fractions

- 2.1 Fractions
- 2.2 Comparing Fractions
- 2.3 Conversion between Improper Fractions and Mixed Numbers
- 2.4 Addition and Subtraction of Fractions
- 2.5 Multiplication of Fractions
- 2.6 Division of Fractions

CHARMAINE, DENNIS AND I WILL GET $\frac{1}{4}$ EACH. THE REST WILL BE FOR YOU, EDWARD.

THEN, WE WILL ALL GET THE SAME AMOUNT.

DISCUSS

How can Grandpa make sure that each person gets an equal share of the pie?

I INTEND TO GIVE $\frac{3}{4}$ OF THE PIES TO MY FRIENDS.

THERE ARE 12 PIES IN A BOX. SO, I AM GIVING AWAY $\frac{3}{4} \times 12 = 9$ PIES TO MY FRIENDS.

YOU MUST BE JOKING! THE PIES ARE SOLD IN BOXES. HOW CAN THERE BE A FRACTION?

DISCUSS

Is it possible to give away a fraction of the box? What does that mean?

OH, I SEE...

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FRACTIONS 37

Based on a comic strip that depicts a familiar real-world context, discussion questions in **Discuss** prompt students to start thinking and get them engaged to learn.

Students will be given opportunities to interpret, discuss, and explain their rationale to their peers and teacher.

Explore, Discover and Construct New Knowledge and Gain New Skills

Knowledge-Building Task

Look at the two patterns.
What do you observe?

$$7 + 3 = 10$$

$$7 + 2 = 9$$

$$7 + 1 = 8$$

$$7 + 0 = 7$$

Line 1 $7 + (-1) = \square$

Line 2 $7 + (-2) = \square$

$$7 - 3 = 4$$

$$7 - 2 = 5$$

$$7 - 1 = 6$$

$$7 - 0 = 7$$

Line 3 $7 - (-1) = \square$

Line 4 $7 - (-2) = \square$

As part of the guided inquiry and active learning approach, students are provided with opportunities to explore, discover, and construct new mathematical knowledge through scaffolded learning activities found in the **Knowledge-Building Task**.

Some of these tasks present opportunities for students to practice Thinking and Working Mathematically (TWM) and are denoted with the TWM star.

What are the missing numbers in
Lines 1, 2, 3 and 4?

Do you observe that

$$7 + (-1) = 6$$

$$7 + (-1) = 7 - 1 = 6$$

$$7 + (-2) = 5$$

$$7 + (-2) = 7 - 2 = 5$$

$$7 - (-1) = 8$$

$$7 - (-1) = 7 + 1 = 8$$

$$7 - (-2) = 9$$

$$7 - (-2) = 7 + 2 = 9$$

Grade 7 Student Book p.126

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Performance Task

Let's Bake!

The following shows the ingredients required for making a chocolate cake for 4 persons.

3 cups of flour
2 cups of sugar
 $\frac{2}{3}$ cup of cocoa powder, sifted
2 teaspoons of baking soda
1 teaspoon of salt
1 cup of brewed coffee
1 cup of oil
4 large egg whites
1 teaspoon of vanilla essence



Use the recipe to make a chocolate cake for 12 persons.
Which ingredient does she have to use?

3 cups of flour

2 cups of sugar

$\frac{2}{3}$ cup(s) of cocoa powder, sifted

2 teaspoons of baking soda

☐

teaspoon(s) of salt

☐

cups of brewed coffee

☐

cup(s) of oil

☐

large egg whites

☐

teaspoons of vanilla essence

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Grade 7 Student Book p.11

Performance Task

allows students to collaborate in pairs or groups, apply their previously acquired knowledge and make decisions based on what they have learnt.

It fosters creative thinking by engaging students to solve non-routine problems. Teachers will be able to do a quick check on students' thinking and conceptual understanding.

Reinforce Their Conceptual Understanding and Hone Their Skills

2.4

Addition and Subtraction of Fractions

YOU WILL LEARN TO

- add and subtract two simple fractions,

e.g. $\frac{1}{8} + \frac{9}{8} = \frac{10}{8} = \frac{5}{4}$

Adding and Subtracting Fractions with the Same Denominator

For fractions with the same denominator, we can simply add or subtract the numerators. Always reduce the final answer to the simplest form where possible. We can also use a calculator and a number line to help us add or subtract the fractions.

Scaffolded worked **examples** with detailed explanations guide students on the correct approaches and methods used in solving the problems. Students will learn and model their own working based on the steps shown in the example.

Example 13

Evaluate the following.

a $\frac{1}{6} + \frac{2}{6}$

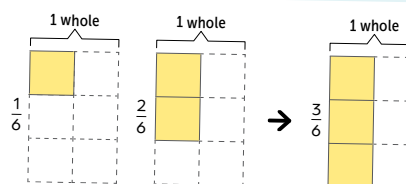
b $\frac{7}{11} + \frac{8}{11}$

a Solution: $\frac{1}{6} + \frac{2}{6} = \frac{1+2}{6}$
 $= \frac{3}{6}$
 $= \frac{3 \div 3}{6 \div 3}$
 $= \frac{1}{2}$

The fractions have the same denominator. Add the numerators.

There is a common factor, 3, in the numerator and the denominator.

Reduce to the simplest form.



$$\frac{1}{6} + \frac{2}{6} = \frac{1}{2}$$

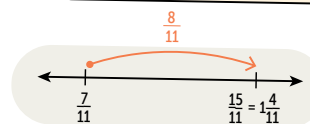
b Solution: $\frac{7}{11} + \frac{8}{11} = \frac{7+8}{11}$
 $= \frac{15}{11}$
 $= 1\frac{4}{11}$

Convert to a mixed number.

$$\frac{7}{11} + \frac{8}{11} = 1\frac{4}{11}$$

Note!

Do not add the denominators.



Try! Evaluate the following.

a $\frac{2}{17} + \frac{4}{17}$

b $\frac{8}{11} + \frac{5}{11}$

$$\frac{11}{2} \div \left(\frac{11}{9}\right) = \frac{11}{2} \times \frac{9}{11} = \frac{9}{2}$$

Students are also given **Try!** practice questions that are similar to these examples, helping them develop procedural fluency and confidence in applying the concepts learnt in a similar context.

Grade 7 Student Book p.88

Concept-Building Questions help to build a sound understanding of foundational maths concepts. Questions are varied and progressively increase in difficulty and help students gain procedural fluency and mastery.

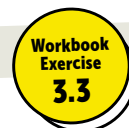
Practice 3C

Concept-Building Questions

- 1 Round each of the following to 1 decimal place.
 a 81.45 b 0.812 c 0.3784
- 2 Round each of the following to 2 decimal places.
 a 38.441 b 2.985 c 0.1003
- 3 Round each of the following to the nearest whole number.
 a 0.51 b 7.95 c 0.333
- 4 Express each of the following fractions to the number of decimal places given in the brackets.
 a $\frac{1}{33}$ (2 d.p.) b $\frac{14}{23}$ (1 d.p.) c $\frac{17}{53}$ (2 d.p.)
- 5 Use a calculator to find the values of the following numbers rounded to the required number of decimal places.
 a $\sqrt{20}$ (3 d.p.) b $\sqrt[3]{21}$ (5 d.p.) c π^2 (6 d.p.)

Context-Based Questions

- 6 In one week (7 days), Albert spends 52 hours in front of the computer. What is the average number of hours he spends in front of the computer each day? Round your answer to the nearest whole number.
- 7 The thickness of one sheet of paper is 0.0385167 mm. Round this measurement to 5 decimal places.
- 8 Mazen said that $\sqrt{4\Box}$ is a whole number. What could the missing number be?



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Context-Based Questions are provided for students to apply their knowledge and hone their problem-solving skills in different contexts.

Besides corresponding workbook exercise questions, additional questions are available through accessing the **AI-Driven Personalised Digital Assessment*** via the Student's eBook*. This provides students with an avenue to strengthen their conceptual understanding. More challenging questions are also available to stretch students' capabilities.

*These resources will not go through the Cambridge International endorsement process.

Reinforce Their Conceptual Understanding and Hone Their Skills

CHAPTER 10 Maps, Scales and Transformations

Exercise 10.1

1 For each of the following, express the scale in the form 1 : n .

a 1 cm represents 3 m.

b 1 cm represents 60 m.

c 1 cm represents 400 m.

d 1 cm represents 2 km.

e 2 cm represents 500 m.

f 2 cm represents 3 km.

2 The scale of a map is 1 : 12 500. The distance between two apartment blocks on the map is 1.2 cm. Find the actual distance between the two apartment blocks, giving your answer in metres.

Grade 7 Workbook p.178–179

3 On a map, 1 cm represents 200 m. The distance between two shopping complexes on the map is 2.3 cm. Find the actual distance between the two shopping complexes, giving your answer in kilometres.

Exercise questions in the Workbook provides further practice questions for students to reinforce their conceptual understanding and master the concepts. These questions correspond to the practice questions in the Student's Book.

4 On a map, 1 cm represents 0.2 km. The actual distance between two towns is 12 km. Find the distance between the two towns on the map.

Non-routine questions appear as **Activities** in the Workbook and provide an extension for students to explore mathematical concepts further and deeper. Thinking and Working Mathematically (TWM) skills are integrated in some of these activities to reinforce the eight characteristics and are marked with a TWM star.

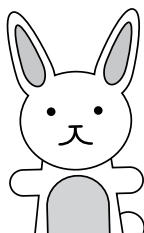
Activity 1A

Evaluate the following and find out the rabbit's favourite food.

Your calculator gives ...

E	$20 \div (34 - 30) \times (56 \div 8)$	
O	$22 \div [(18 \div 2) - (36 \div 6)]$	
V	$[(21 \div 7 + 12) \div 8] - (45 \div 9)$	
L	$(13 \times 8) \div 4 + 11 - (36 \div 9)$	
R	$[(45 \div 15) - 3] + 28 \div 2$	
C	$3 \times 2 + 4 \times 6 - 20 \div 5$	
A	$[8 - (4 \div 2)] + 27 \div 3 + 3$	
S	$(64 \div 4) \times 2 - 49 \div 7 \times 3$	

26 33 52 0 35 14 11



8 CHAPTER 1

Grade 7 Workbook p.8, p.74

Activity 5E

In this activity, you will learn to interpret notations of algebraic terms.

1 Using a calculator, find the value of the following.

a $2 \times 3 =$ _____ b $3 \times 2 =$ _____

c $12 \times 5 =$ _____ d $5 \times 12 =$ _____

e $17 \times 32 =$ _____ f $32 \times 17 =$ _____

g $134 \times 54 =$ _____ h $54 \times 134 =$ _____

2 Observe the answers above, what can you say?

For any two numbers x and y , we say that $x \times y = y \times x$. In short, $xy = yx$.

3 Using a calculator, find the value of the following.

a $3 \times 3 =$ _____ b $3^2 =$ _____

c $5 \times 5 =$ _____ d $5^2 =$ _____

e $7.5 \times 7.5 =$ _____ f $7.5^2 =$ _____

g $\frac{1}{2} \times \frac{1}{2} =$ _____ h $\left(\frac{1}{2}\right)^2 =$ _____

4 Observe the answers above, what can you say?

For any number x , we say that $x^2 = x \times x$.

74 CHAPTER 5

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Chapter 1 Revision

1 Evaluate the following.

- a $7 + (-3)$ b $-6 + (-5)$ c $17 - (-2)$ d $-6 - (-3)$

2 Fill in the boxes with ' $<$ ' or ' $>$ ' to make the following statements true.

- a $4 \square 5$ b $10 \square 7$ c $-3 \square 1$ d $-2 \square -6$

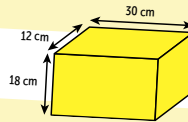
3 Evaluate the following.

- a $-11 + 5 - 8$ b $120 - 80 - 50$ c -15×8
 d $-64 \div (-16)$ e $(82 + 18) \div 4 - 12$ f $[32 - (49 \div 7) \times 4] + 80$

4 Three fire alarms go off at regular interval of 3 minutes, 5 minutes and 8 minutes. They first go off at 10 a.m. At what time will the three alarms be heard together?

5 Small cubes all of equal sides are to be cut from the cuboid.

- a What is the largest size of cubes that can be cut?
 d How many of the cubes?



6 Check whether the numbers can be divisible by 2, 3, 4, 5, 6, 7, 8, 9 or 10.

- a 504 d 12 345 678

7 Write down the smallest number that is divisible by 2, 3, 4, 5, 6, 7, 8, 9 and 10.

8 Evaluate the following.

- a $\sqrt{81} + 23$ b $55 \div \sqrt{121}$
 c $42 \times \sqrt[3]{125} - 3^3$ d $72 \times \sqrt[3]{1000} - \sqrt{100}$

Revision questions provide an opportunity for students to assess their understanding of all the concepts learnt in that chapter.

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NUMBERS 35

Grade 7 Student Book p.35–36

Based on the Revision questions, students can use the **self-assessment checklist** to evaluate and monitor their mastery of the Maths concepts and skills. This will inform students on their areas of weaknesses and for teachers to check on students' progress to prescribe any follow-up actions.

Objectives

1

Use negative numbers.

Questions

1a, b, c, d

Score

4

Understand place values to compare and order numbers using $<$, $>$, \leq , \geq .2a, b, c, d;
9a, b, c

13

Add, subtract, multiply and divide numbers including combined operations.

3a, b, c, d, e, f

6

Apply concepts of HCF and LCM.

4, 5

6

Apply divisibility tests

6, 7

6

Find squares, square roots, cubes and cube roots.

8a, b, c, d

4

Total

28

Practising on an AI-driven Personalised Digital Assessment to become Self-Directed Learners*

Using an AI-driven software, our series has incorporated a Personalised Digital Assessment to help every student attain Mathematical mastery.

As a student attempts the practice questions, the AI engine monitors the student's progress, providing immediate feedback and generates questions based on the student's current readiness level, depending on whether the student answers correctly or incorrectly.

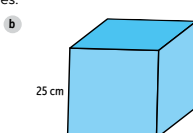
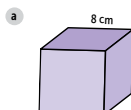
When a student answers a question correctly, the software will generate questions of greater difficulty level or move on to the next learning objective. When a student answers the question incorrectly, the software will generate questions of similar difficulty.

This personalised assessment allows every student to progress independently at their own pace and eventually become self-directed learners.

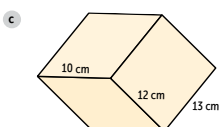
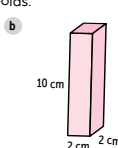
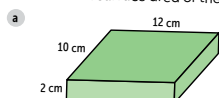
Practice 11E

Concept-Building Questions

- 1 Find the total surface area of the following cubes.



- 2 Find the total surface area of the following cuboids.



Access **AI-Driven Personalised Digital Assessment*** through the Student's eBook on MCEduHub.

Context-Based Questions

- 3 Ramli paid a painter to paint a sculpture in the shape of a cuboid of dimensions 2 m by 3 m by 5 m. He was charged a fee of \$5 to paint 1 m^2 . How much does he need to pay for painting the cuboid?
- 4 The surface area of a cube is 24 cm^2 . Find the length of the cube.



Grade 7 Student Book p.391

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The AI-Driven Personalised Digital Assessment* Generates Questions of Different Difficulty Levels

3. Ratio and Proportion

2 Exercises with 3 levels each, finish each level to unlock the next




3.1 Ratio

Let's Practice >

3 0% Practice Level Capable Practice Level Strong Practice Level Ninja Let's Practice >

← Practising Now Capable 0% Practice Level Strong Practice Level Ninja

Question Collapse ^
Find the ratio of the mass of the cat to the mass of the dog to the mass of the lion.

Cat
2 kg

Dog
21 kg

Lion
193 kg

AI-generated practice questions

⊗ exit question Progress Capable 66.67%

Question ⌵
Simplify $0.4\text{ m} : 70\text{ cm}$. Express your answer as a fraction in its simplest form.

Answer

$\frac{4}{7}$

*These resources will not go through the Cambridge International endorsement process.

Hint

To compare two quantities using ratio, both quantities must be measured in the same unit.

$$1 \text{ kg} = 1000 \text{ g}$$

Hint

(1) Convert the mixed fraction to the improper fraction.

(2) Divide the improper fraction with 21 and multiply by 100% to get the percentage.

Hints and Worked solutions with explanations

are provided and are similar to the worked examples found in the Student's Books for students to reinforce conceptual understanding and build problem-solving skills on their own.

Correct Answer

$$1.2 \text{ kg} : 1400 \text{ g}$$

$$= 1.2 \times 1000 \text{ g} : 1400 \text{ g}$$

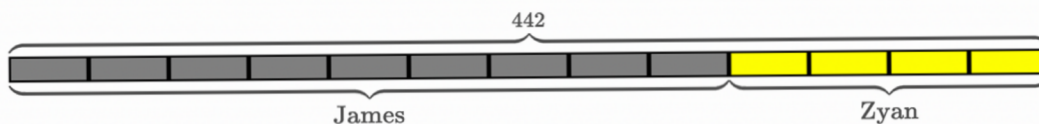
$$= 1200 : 1400$$

$$= \frac{1200}{1400}$$

$$= \frac{6}{7}$$

(Change the greater unit to the smaller unit.)
(Remove the same unit.)

Correct Answer



$$13 \text{ units} \rightarrow 442 \text{ toffees}$$

$$1 \text{ unit} \rightarrow \frac{442}{13} \text{ toffees}$$

$$1 \text{ unit} \rightarrow 34 \text{ toffees}$$

$$9 \text{ units} \rightarrow 9 \times 34 = 306 \text{ (Larger share)}$$

$$4 \text{ units} \rightarrow 4 \times 34 = 136 \text{ (Smaller share)}$$

a) James got the larger share.

b) The larger share is 306 toffees.

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A Comprehensive Suite of Digital Resources to Facilitate Effective Learning and Teaching*

Besides the Student's Book and eWorkbook, the suite of digital teaching resources also includes the editable Schemes of Work (SOWs), Lesson Plans, Worked Solutions for the Student Book and Workbook, as well as Question Banks. This suite of teaching resources allows for flexibility and customisation depending on the needs of the students.

Additionally, teachers have a teacher's account to access the AI-Driven Personalised Digital Assessment where they can track and monitor students' progress. All these teaching resources are aimed to help teachers reduce their workload and time spent on lesson preparation and are easily accessible via the portal, anytime and anywhere.

Digital Teaching Resources*

The **Teacher's Guide** consists of the following:

Editable SOWs*

Helps teachers in lesson preparation by outlining all the learning requirements and the suggested teaching periods/lessons. An outline of the strand of Thinking and Working Mathematically (TWM) is provided to facilitate lesson planning.

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Scheme of Work

Total duration: 10 periods (1 period is approximately 40 minutes.)

Sections	No. of Periods	Learning Outcomes	Resources	Thinking and Working Mathematically
Chapter Opener	1		<ul style="list-style-type: none"> Student's Book 7, Chapter 11, p. 364 	<ul style="list-style-type: none"> Convincing Critiquing Improving
11.1 Measurement of Area		<ul style="list-style-type: none"> 7Gg.04 Understand the relationships and convert between metric units of area, including hectares (ha), square metres (m²), square centimetres (cm²) and square millimetres (mm²). 	<ul style="list-style-type: none"> Student's Book 7, Chapter 11, pp. 365-367 Workbook 7, Chapter 11, Exercise 11.1 Personalised Digital Assessment* 11.1 	<ul style="list-style-type: none"> Convincing Critiquing Improving
11.2 Area of Triangles and Compound Shapes	2	<ul style="list-style-type: none"> 7Gg.05 Derive and know the formula for the area of a triangle. Use the formula to calculate the area of triangles and compound shapes made from rectangles and triangles. 	<ul style="list-style-type: none"> Student's Book 7, Chapter 11, pp. 368-374 Workbook 7, Chapter 11, Exercise 11.2 Personalised Digital Assessment* 11.2 	<ul style="list-style-type: none"> Generalising Specialising Conjecturing Critiquing Convincing Improving
11.3 3D-Shapes and Measurement of Volume	2	<ul style="list-style-type: none"> 7Gg.06 Identify and describe the combination of properties that determine a specific 3D shape. 	<ul style="list-style-type: none"> Student's Book 7, Chapter 11, pp. 375-382 Workbook 7, Chapter 11, Exercise 11.3 Personalised Digital Assessment* 11.3 	<ul style="list-style-type: none"> Characterising Classifying Generalising Convincing Critiquing Improving

*This material has not been through the Cambridge International endorsement process.

**These resources will not go through the Cambridge International endorsement process.*

Editable Lesson Plans*

Introduce key mathematical concepts with lesson suggestions, ideas on support and challenge for differentiated instructions to help teachers deliver lessons effectively and efficiently.

Notes on TWM help teachers facilitate discussions and ensure students are practising the eight TWM characteristics. Common misconceptions are highlighted for teachers to advise students on possible pitfalls.

Marshall Cavendish Education Cambridge Lower Secondary Mathematics – Gr
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1.1 Integers and Place Value

Suggested Duration: 120 minutes

Learning Outcomes:

At the end of the lesson, students should be able to:

- Use negative numbers.
- Represent and arrange numbers on the number line.
- Compare numbers.

Estimated Time	Resources Required	Instructional Strategies
5 min	• Student's Book, p. 1,	Chapter Opener <ul style="list-style-type: none"> • Using the comic strip, guide your students to predict what they will be learning in the chapter. • Facilitate the discussion to find out the pre-requisite knowledge and skills of your students. • Encourage your students to recall situations where they have encountered negative numbers in daily life. <ul style="list-style-type: none"> ➤ What do you think a negative number is? What is the freezing point of water? How cold do you think -89°C will be? • Students practise critiquing (TWM.07) when they can explain how the temperatures are different and why Sam and Sarah are feeling differently even why the temperature both shows 12°C. Invite students to discuss the significant of '-' sign.
5 min	• Student's Book, p. 2, Recall	Recall <ul style="list-style-type: none"> • Help your students recall the difference between place and value of a number. Then encourage them to identify the place value of each digit in the number 3 864 975. • Write numbers with the digit 0 on the board to help students recall the use of '0' as place holders, e.g., 2003. • Challenge your students to form the largest three-digit number without repeating any digits.

Maths Ahead Grade 9 Question Bank

Chapter 4 Algebra

Chapter 4 Algebra

Concept-Building Questions

- Evaluate the following when $x = 3$.
(a) $-11x + 2$ (b) $(2x - 3)^2 - 3x$ (c) $(x - 5)^2 + (3x + 1)^2$
- Evaluate the following when $x = -5$ and $y = 6$.
(a) $\frac{x}{5y} + \frac{y}{5x}$ (b) $(x + 2y)^2 + 3x$ (c) $(x - 1)^2 + (y - 2)^2$
- Expand the following.
(a) $5x(6y)$ (b) $(-2u)(8v)$ (c) $(3p)(-2q)(5r)$
- Expand and simplify the following.
(a) $(x - 3)(x + 5)$ (b) $(x - 3)^2$ (c) $(x + 7)(x - 7)$
- Evaluate the following without using a calculator.
(a) $3^2 + 2 \times 3 \times 7 + 7^2$ (b) $81^2 - 19^2$
- Simplify the following.
(a) $8x^5 \times 4x^3$ (b) $\frac{1}{2}y^8 \div \frac{1}{6}y^2$ (c) $(11z^5)^2$
- Simplify the following.
(a) $(3x - 4)^2$ (b) $(2x + 1)^2$ (c) $y(x - 3y)$

Question Bank*

Consists of questions of graded difficulty levels that follows the format of the questions in the Student's Book for teachers to adapt and customise for formative or summative assessment purposes.

*These resources will not go through the Cambridge International endorsement process.

Worked Solutions for Textbook Exercise Questions

Chapter 4
Ratio and Proportion
Worked Solutions for Textbook Exercise Questions

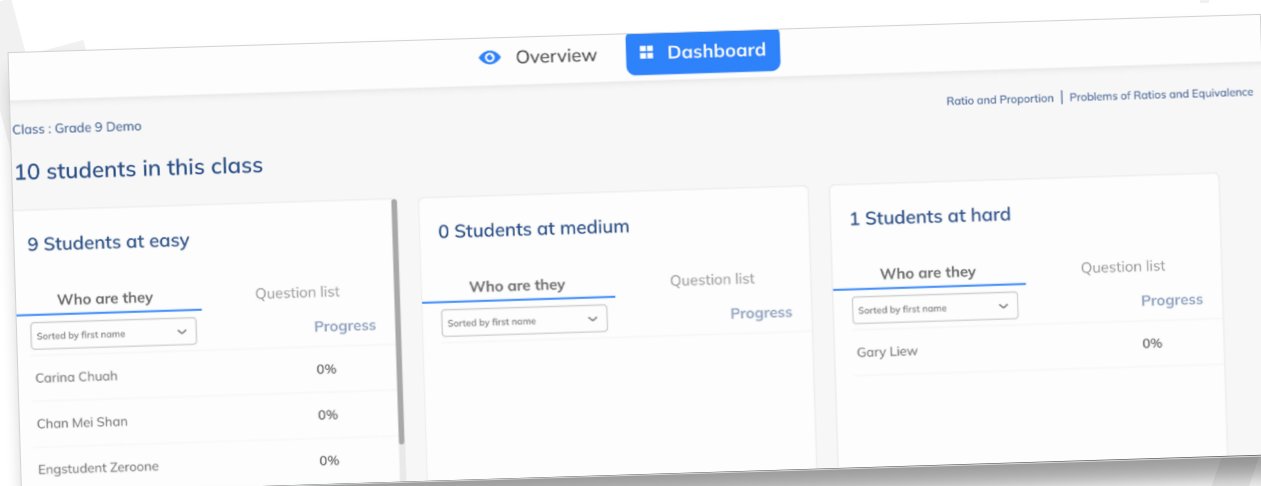
Practice 4A

- 1 Sam's savings : Mali's savings
= \$53 : \$65
= 53 : 65
- 2 Hari's height : Han's height
= 161 cm : 158 cm
= 161 : 158
- 3 (a) 0.85 m : 73 cm
= 85 cm : 73 cm
= 85 : 73
(b) $\frac{1}{9} : \frac{7}{9}$
= 1 : 7
(c) $\frac{1}{4}$ h : 17 min
= 15 min : 17 min
= 15 : 17
- (b) $8 : 4 = 32 : 16$
Since the ratios are the same, they are equivalent.
- 3 $5 : 4 = 60 : 48$
Eva's score for paper 2 is 48.
- 4 (a) Sam's working hours : Jamie's working hours
= 20 hours : 12 hours
= 20 : 12
= 5 : 3
(b) Sam's salary : Jamie's salary
= \$100 : \$60
= 100 : 60
= 5 : 3
(c) For Sam:
20 hours → \$100
1 hour → $\frac{100}{20} = \$5$
For Jamie:
12 hours → \$60
1 hour → $\frac{60}{12} = \$5$
The salaries were fair since they are paid the same amount of money per hour worked.

Worked Solutions*

Provide the answers and full worked solutions to the questions found in the Student's Book and the Workbook to assist teachers in the marking and grading of students' assignments and homework.

Teacher's Dashboard for Monitoring and Tracking Student's Progress



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Other Products

You may also be interested in:

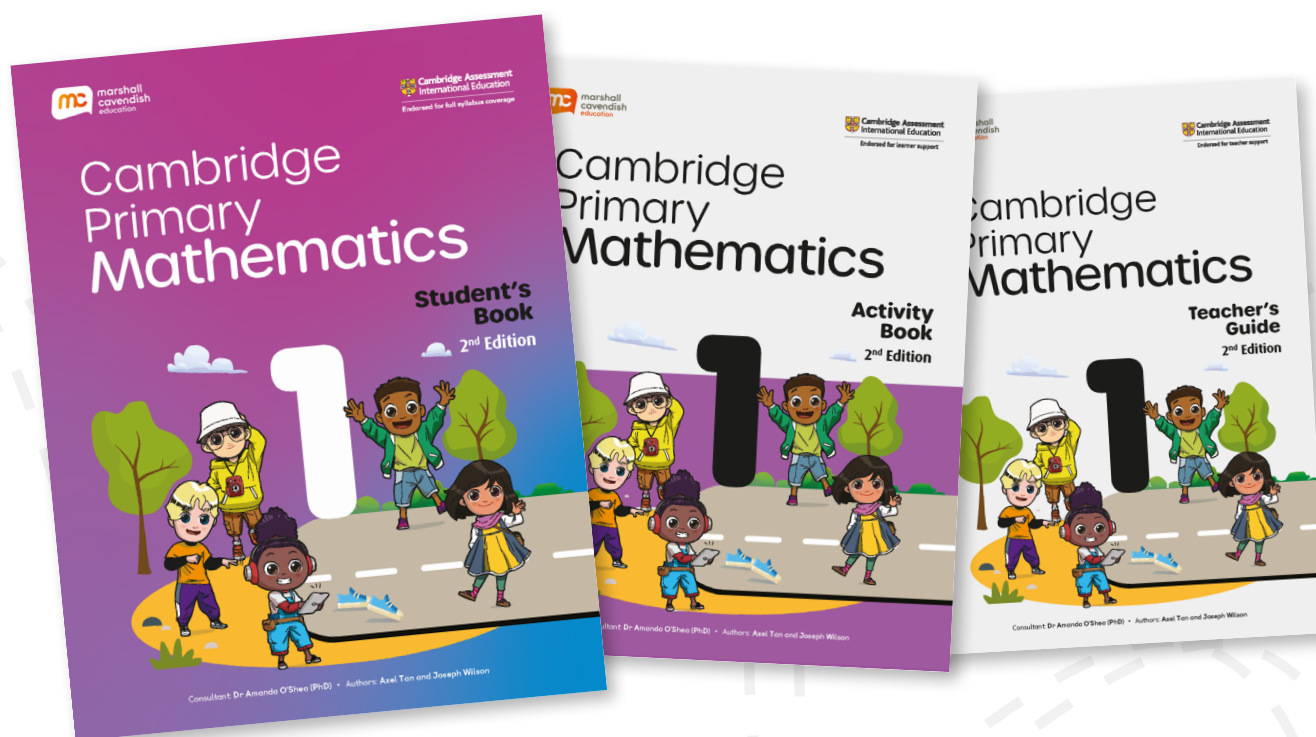


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Cambridge Primary Mathematics

Stage 1 - 6 | Age 7 - 12



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Our package nurtures Cambridge active learners, using the Concrete-Pictorial-Abstract (CPA) approach, helping them develop conceptual understanding. The series draws on Singapore's tried and tested methodologies that focus on mastery through sequencing of concepts. Through activities that promote engagement, curiosity, innovation and reflection, learners are encouraged to become more confident and self-directing. Incorporating the new Thinking and Working Mathematically skills, the series develops learners as 21st century mathematical thinkers within a globalised community.

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While the series are fully aligned to the Cambridge syllabuses, the pedagogies and teaching practices follow those used in Singapore – one of the top performing countries in international assessments such as Trends in International Maths and Science Study (TIMSS) and Programme for International Student Assessment (PISA).

Both series are anchored on the belief that all learners can learn and succeed in Maths regardless of their learning readiness. The series emphasise on developing learners' conceptual understanding and problem-solving skills, allowing them to eventually achieve mastery. The series also comes complete with a comprehensive suite of print and digital resources that help 21st century learners and teachers succeed.

This series is pending endorsement from Cambridge Assessment International Education.

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Series Architecture

- **Student's Book** (Print and eBook)
- **Workbook** (Print and eBook)
- **Teacher's Guide**
- **Additional Digital Resources*** (Available on MCEduHub)
 - Editable Lesson Plans
 - Downloadable SOWs in Word
 - Question Bank for each chapter in Word
 - Student eBook
 - Personalised Digital Assessment
 - Virtual Manipulatives (VM)

**These resources will not go through the Cambridge International endorsement process.*