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Computer science resources

Brighter Thinking
Better Learning

Building Brighter Futures **Together**

Contents

Key to icons

Print book

Digital resource

Print book and digital resource bundle

Welcome to the **Computer Science Catalogue**

We are now very much living in a digital age, with computer programs being a core part of our everyday lives. A truly exciting time to be learning and teaching computer science!

Our resources for OCR and AQA GCSE get students working with real-world programming whilst building their understanding of the fundamental concepts of computing. A/AS Level Computer Science for OCR and WJEC/Eduqas help students build upon their acquired knowledge to master the underlying principles and concepts of this subject. Whether your students are studying GCSE or A/AS Level, they will explore how computer science relates to their everyday lives, learn to solve problems and develop their computational skills.

Our ever-popular Key Stage 3 *Coding Club* series on page 10 guides your young programmers to create their own version of games and apps! Over three levels your students will find the series both stimulating and lots of fun.

If you're teaching the Cambridge International syllabuses, you can view our Cambridge IGCSE™ and Cambridge International AS & A Level resources on pages 16–17.

For more information, please contact your local sales consultant or visit cambridge.org/education

Building brighter futures together

We put teachers first and work with Brighter Thinkers

Everything we do begins with you, and a clear understanding of your needs and aspirations – because we believe teachers are at the heart of learning.

We learn from, and work with leading educationalists and authors in Cambridge and around the world to embed best teaching and learning practice. We only adopt evidence-based approaches in our resources.

To support teaching and accelerate learning

Practical and proven pedagogy

We embed approaches to teaching and learning that engage and motivate students to participate in an active classroom.

Language of learning

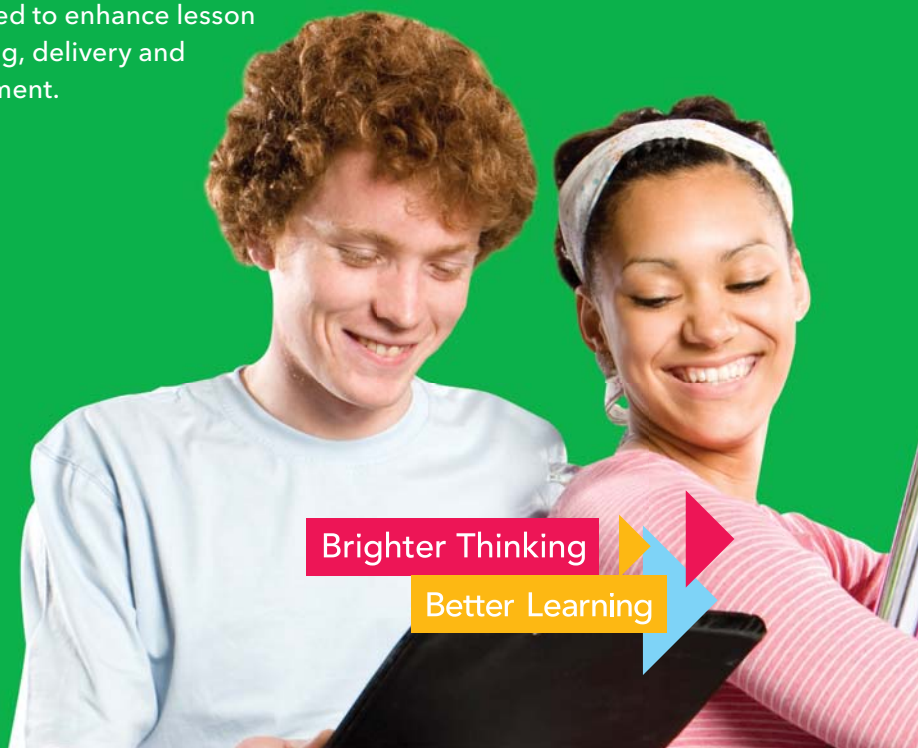
We use accessible language that makes new and complex ideas easier to understand, helping learners to progress.

Toolkit for teachers

We offer a blend of print and digital resources, together with a range of professional development services, designed to enhance lesson planning, delivery and assessment.

And develop skills for life

Our approach encourages students to be creative and critical thinkers, to be resourceful collaborators and communicators, and to be confident problem solvers and decision makers in education and in life.



GCSE Computer Science for OCR

A comprehensive suite of print and digital GCSE Computer Science resources tailored to the OCR GCSE Computer Science specification.

- Written by an experienced teacher and assessment leader
- A strong focus on developing students' computational thinking, programming, problem-solving skills and mathematical concepts
- Includes rich digital content, real-life examples and challenges to help students relate computer science to everyday life
- Supports teachers with the delivery of the specification and the transition from ICT to computer science

Revised for the updated OCR syllabus (J277)

You gave us feedback and we listened. We have:

- Reordered the contents of the book to more closely match the syllabus order
- Updated many of our practice questions
- Included reflection exercises at the end of every chapter

Learning outcomes

List of the learning objectives and the specification points covered in the chapter.

Challenge

Helps focus students on real-life application of the skills and knowledge they will learn in the chapter.

Real-life examples

Familiar real-life scenarios that help students to understand how their learning is important to everyday life.

9 Algorithms

Learning outcomes

By the end of this chapter you should be able to:

- explain what is meant by computational thinking
- explain what is meant by *decomposition*, *abstraction* and algorithmic thinking and use them to solve problems
- create algorithms to solve problems that you have analysed
- identify the inputs, processes and outputs for a problem
- create, interpret, correct, complete and modify algorithms using flowcharts

Challenge: create an algorithm to help a taxi company calculate its fares

- By the end of this chapter, you should have a thorough knowledge of how algorithms can be used to solve complex problems and how they can be displayed using flow charts.
- Your challenge is to use this knowledge to help a taxi company calculate its fares.

Algorithms run our world! In every area algorithms are used to decide what action should be taken in a particular circumstance and as computers can consider all the possibilities far more quickly than a human brain, they are becoming more important to the running of the world. Here are just a few examples.

- In a game of chess, when each player has made 3 moves, there are over 9 million possible moves available; after 4 moves there are over 288 billion possible moves. Computers have the ability to consider all these possible moves far more quickly than humans. That is why no chess grandmaster has beaten a top computer chess algorithm since 2005.
- Algorithms are used by financial organisations to trade shares on the stock market. A computer following an algorithm can decide which deal to make far more quickly than a human and a split second difference can be worth millions of pounds.
- Closely guarded algorithms are used for Internet searches to make them quicker and the results more relevant to the user. They will even auto-complete the search terms based on previous searches.

Algorithms are used to control automatic-pilot systems in airplanes. You have probably been piloted by an algorithm!

2

Computational thinking

A computer scientist's job can be divided into three areas:

1. defining and analysing problems
2. creating a structured solution or algorithm
3. coding the solution.

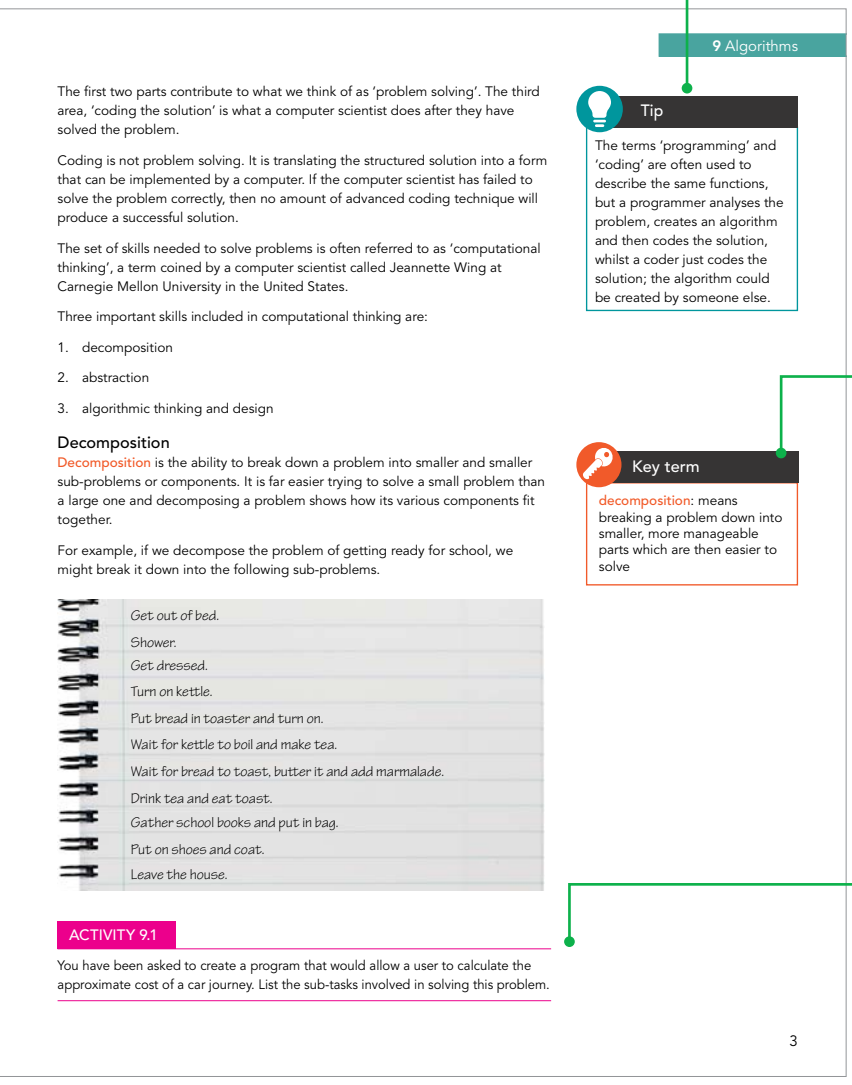
GCSE Computer Science OCR components

Student book

Our OCR-endorsed GCSE Computer Science student book uses an exciting and engaging approach to help students master underlying computing principles and concepts and develop their computational thinking, programming and problem-solving skills.

- Underpinned by computational thinking and designed to equip students with core strategies and concepts such as logic and algorithms
- Coding challenges develop programming skills and help prepare students for the assessment
- Contains contextual activities to support the less confident and open-ended challenges to stretch the more able

OCR Student Book
9781108812542



Tip

Tip boxes contain helpful guidance and points to consider.

Key terms

Key terms are highlighted and explained throughout.

Activity

Regular exercises that allow students to put their learning into practice and investigate new ideas.

GCSE Computer Science for OCR (cont.)

Cambridge Elevate enhanced edition

This digital edition combines the content of our OCR student book and the Cambridge Elevate digital features to offer a dynamic and flexible solution to delivering the GCSE Computer Science qualification.

- Rich digital content helps students relate computer science to everyday life
- Animated tutorials and coding presentations help students understand difficult concepts
- Features a wide variety of practice problems, interactive worksheets and exam-style questions to help with exam preparation
- Contains examples in Python and interactive guidance and answers which explain the coding language used
- 'Assess to Progress' tool supports assessing, tracking and reporting of students' progress

OCR Cambridge Elevate enhanced edition School Site Licence (1 Year)*	
1 Year	9781108812566

OCR Cambridge Elevate enhanced edition**	
2 Years	9781108812559

OCR Print Student Book plus Cambridge Elevate enhanced edition**	
2 Years	9781108873932

*Unlimited number of teachers and students within the same school.
**Individual licences available.

Users change font size and style to adapt the content.

Search functionality allows users to find the content they need easily.

Teachers and students can highlight important information, add notes, annotations, weblinks, hyperlinks and audio recordings.

Teachers can add bookmarks to create direct links to content they want their students to see and download or upload content to their school's VLE.

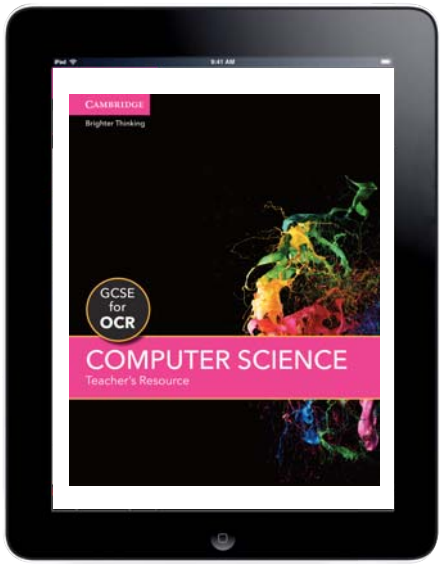
Teachers can send notes and messages directly to their student groups.

Teacher's resource

Mapped to the student book, our FREE teacher's resource offers practical support in delivering the curriculum confidently, whether teachers are new to programming or specialists in need of time-saving resources and ideas.

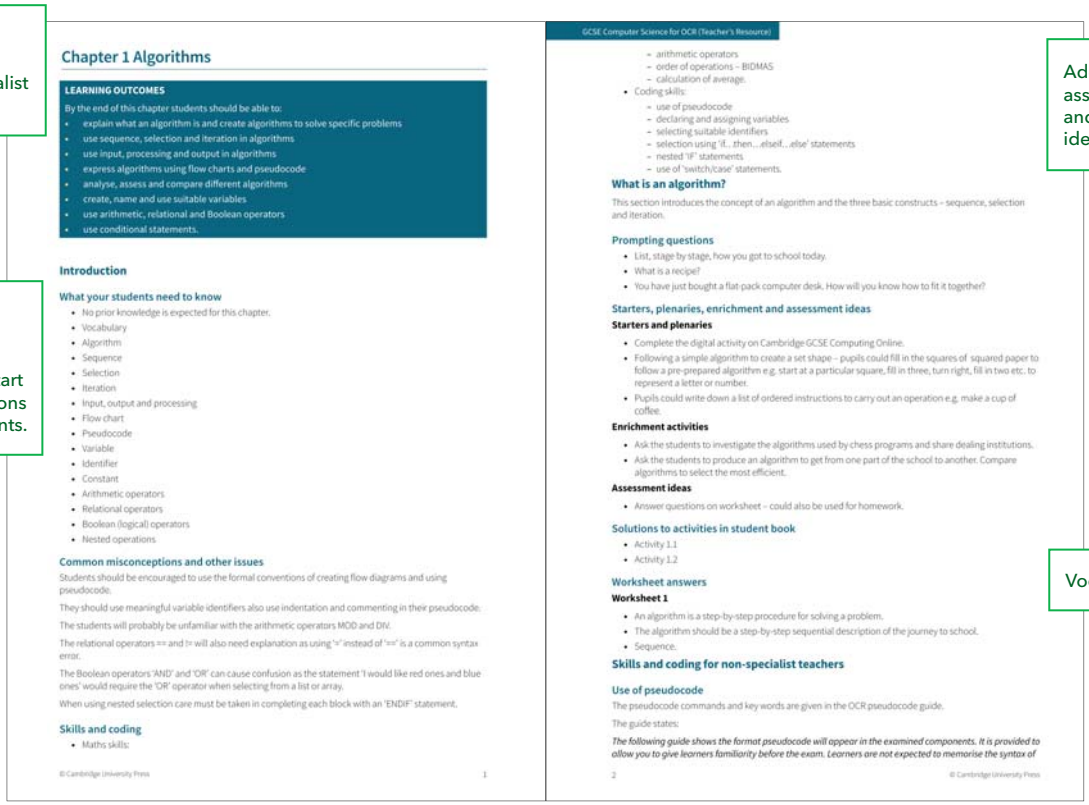
- Features notes on each chapter including sections on learning outcomes, key vocabulary, common misconceptions, skills and coding and homework ideas
- Includes easy-to-follow, practical teaching aids and ideas
- Provides background knowledge for the assessment, assessment ideas and coding competence
- Contains answers to questions featured in the student book

OCR Teacher's Resource Cambridge Elevate enhanced edition	
COMING SOON	FREE with purchase of Cambridge Elevate enhanced edition



Skills and coding for non-specialist teachers.

Prompting questions to help teachers start conversations with students.



Chapter 1 Algorithms

LEARNING OUTCOMES

By the end of this chapter students should be able to:

- explain what an algorithm is and create algorithms to solve specific problems
- use sequence, selection and iteration in algorithms
- use input, processing and output in algorithms
- express algorithms using flow charts and pseudocode
- analyse, assess and compare different algorithms
- create, name and use suitable variables
- use arithmetic, relational and Boolean operators
- use conditional statements.

Introduction

What your students need to know

- No prior knowledge is expected for this chapter.
- Vocabulary
- Algorithm
- Sequence
- Selection
- Iteration
- Input, output and processing
- Flow chart
- Pseudocode
- Variable
- Identifier
- Constant
- Arithmetic operators
- Relational operators
- Boolean (logical) operators
- Nested operations

Common misconceptions and other issues

Students should be encouraged to use the formal conventions of creating flow diagrams and using pseudocode.

They should use meaningful variable identifiers also use indentation and commenting in their pseudocode.

The students will probably be unfamiliar with the arithmetic operators MOD and DIV.

The relational operators == and != will also need explanation as using '=' instead of '==' is a common syntax error.

The Boolean operators 'AND' and 'OR' can cause confusion as the statement 'I would like red ones and blue ones' would require the 'OR' operator when selecting from a list or array.

When using nested selection care must be taken in completing each block with an 'ENDIF' statement.

Skills and coding

- Maths skills:
  - arithmetic operators
  - order of operations – BIDMAS
  - calculation of average.
- Coding skills:
  - use of pseudocode
  - declaring and assigning variables
  - selecting suitable identifiers
  - selection using 'if...then...elseif...else' statements
  - nested 'IF' statements
  - use of 'switch/case' statements.

What is an algorithm?

This section introduces the concept of an algorithm and the three basic constructs – sequence, selection and iteration.

Prompting questions

- List, stage by stage, how you got to school today.
- What is a recipe?
- You have just bought a flat-pack computer desk. How will you know how to fit it together?

Starters, plenaries, enrichment and assessment ideas

Starters and plenaries

- Complete the digital activity on Cambridge GCSE Computing Online.
- Following a simple algorithm to create a set shape – pupils could fill in the squares of squared paper to follow a pre-prepared algorithm e.g. start at a particular square, fill in three, turn right, fill in two etc. to represent a letter or number.
- Pupils could write down a list of ordered instructions to carry out an operation e.g. make a cup of coffee.

Enrichment activities

- Ask the students to investigate the algorithms used by chess programs and share dealing institutions.
- Ask the students to produce an algorithm to get from one part of the school to another. Compare algorithms to select the most efficient.

Assessment ideas

- Answer questions on worksheet – could also be used for homework.

Solutions to activities in student book

- Activity 1.1
- Activity 1.2

Worksheet answers

Worksheet 1

- An algorithm is a step-by-step procedure for solving a problem.
- The algorithm should be a step-by-step sequential description of the journey to school.
- Sequence.

Skills and coding for non-specialist teachers

Use of pseudocode

The pseudocode commands and key words are given in the OCR pseudocode guide.

The guide states:

The following guide shows the format pseudocode will appear in the examined components. It is provided to allow you to give learners familiarity before the exam. Learners are not expected to memorise the syntax of

Additional assessment and activity ideas.

Vocabulary

Note: We are currently updating our teacher's resource in alignment with the OCR syllabus updates (J277)

GCSE Computer Science for AQA

A comprehensive suite of print and digital GCSE Computer Science resources tailored to the AQA GCSE Computer Science specification.

- Written by an experienced teacher and assessment leader
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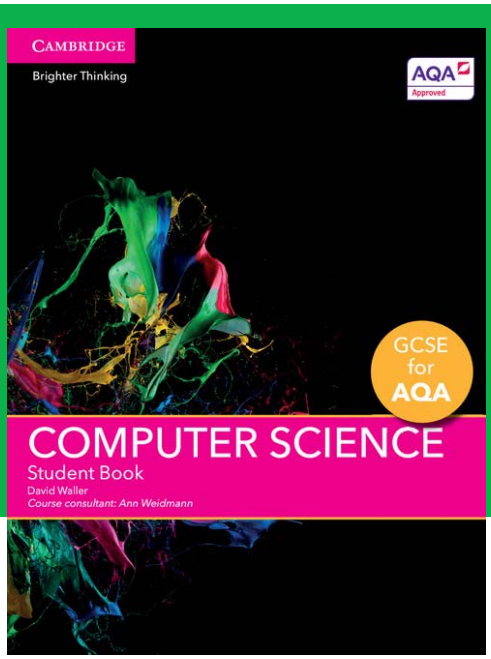
- Includes rich digital content, real-life examples and challenges to help students relate computer science to everyday life
- Supports teachers with the delivery of the specification and the transition from ICT to computer science



Learning outcomes

List of the learning objectives and the specification points covered in the chapter.

Challenge

Helps focus students on real-life application of the skills and knowledge they will learn in the chapter.

Real-life examples

Familiar real-life scenarios that help students to understand how their learning is important to everyday life.

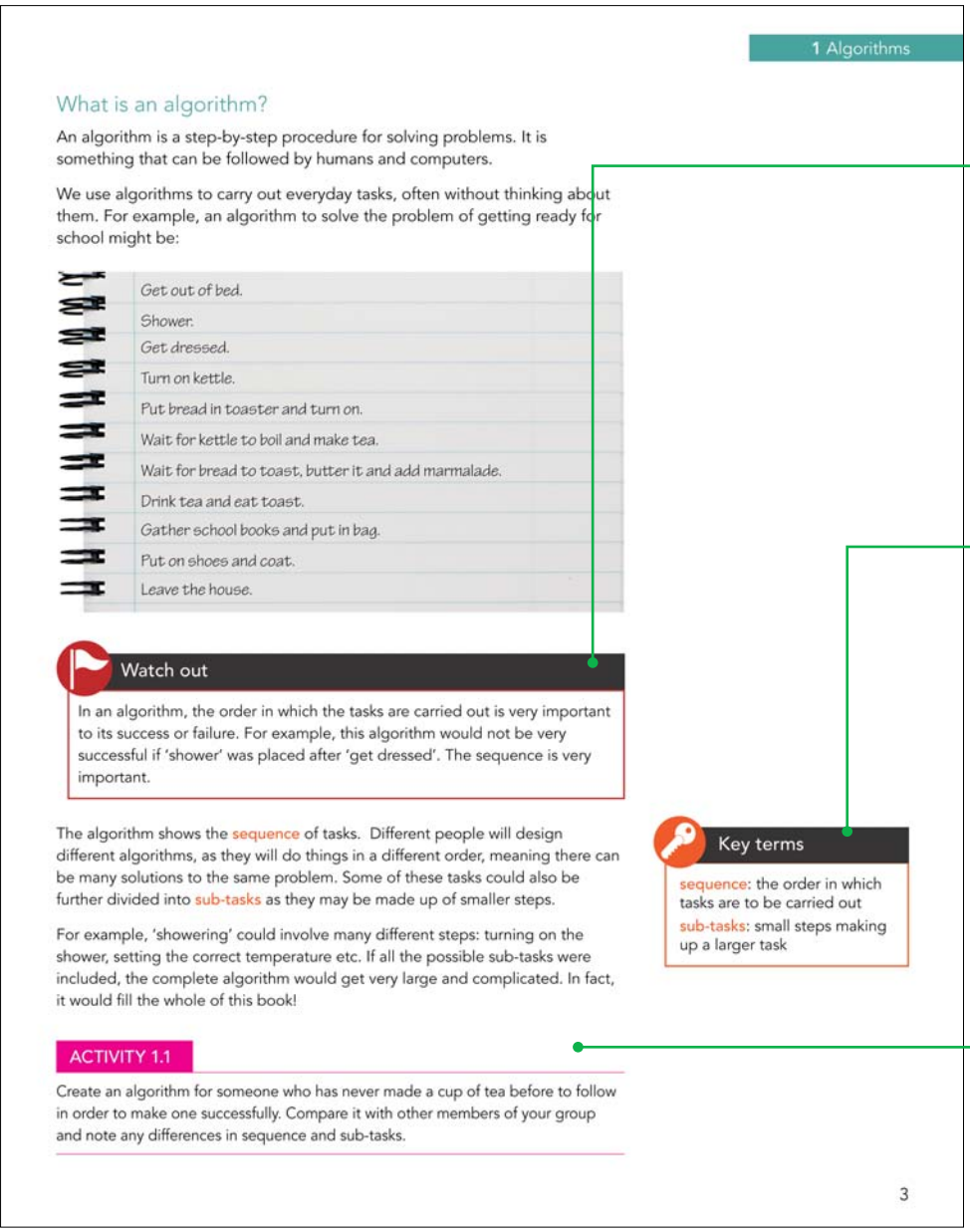
GCSE Computer Science AQA components

Student book

Our AQA-approved GCSE Computer Science student book uses an exciting and engaging approach to help students master underlying computing principles and concepts and develop their computational thinking, programming and problem-solving skills.

- Underpinned by computational thinking and designed to equip students with core strategies and concepts such as logic and algorithms
- Coding challenges develop programming skills and help prepare students for the non-exam assessment
- Contains contextual activities to support the less confident and open-ended challenges to stretch the more able

AQA Student Book
9781316504048



1 Algorithms

What is an algorithm?

An algorithm is a step-by-step procedure for solving problems. It is something that can be followed by humans and computers.

We use algorithms to carry out everyday tasks, often without thinking about them. For example, an algorithm to solve the problem of getting ready for school might be:

Get out of bed.
Shower.
Get dressed.
Turn on kettle.
Put bread in toaster and turn on.
Wait for kettle to boil and make tea.
Wait for bread to toast, butter it and add marmalade.
Drink tea and eat toast.
Gather school books and put in bag.
Put on shoes and coat.
Leave the house.

Watch out

In an algorithm, the order in which the tasks are carried out is very important to its success or failure. For example, this algorithm would not be very successful if 'shower' was placed after 'get dressed'. The sequence is very important.

The algorithm shows the sequence of tasks. Different people will design different algorithms, as they will do things in a different order, meaning there can be many solutions to the same problem. Some of these tasks could also be further divided into sub-tasks as they may be made up of smaller steps.

For example, 'showering' could involve many different steps: turning on the shower, setting the correct temperature etc. If all the possible sub-tasks were included, the complete algorithm would get very large and complicated. In fact, it would fill the whole of this book!

Key terms

sequence: the order in which tasks are to be carried out
sub-tasks: small steps making up a larger task

ACTIVITY 1.1

Create an algorithm for someone who has never made a cup of tea before to follow in order to make one successfully. Compare it with other members of your group and note any differences in sequence and sub-tasks.

3

Watch out

Boxes highlighting common misconceptions.

Key terms

Key terms are highlighted throughout.

Activity

Regular exercises that allow students to put their learning into practice and investigate new ideas.

GCSE Computer Science for AQA (cont.)

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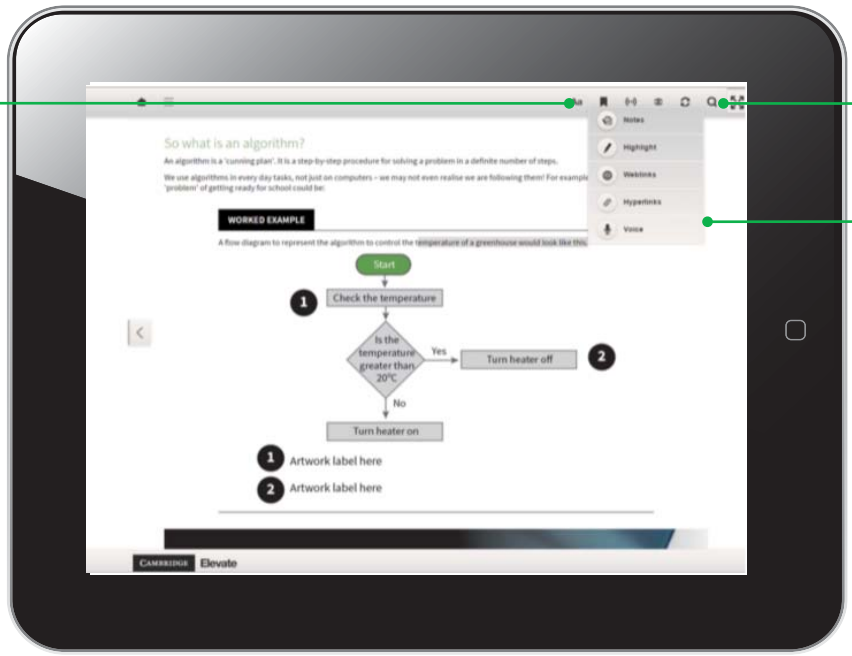
AQA Cambridge Elevate enhanced edition School Site Licence (1 Year)*	
1 Year	9781316609989

AQA Cambridge Elevate enhanced edition**	
2 Years	9781316504079

AQA Print Student Book plus Cambridge Elevate enhanced edition**	
2 Years	9781316504017

*Unlimited number of teachers and students within the same school.
**Individual licences available.



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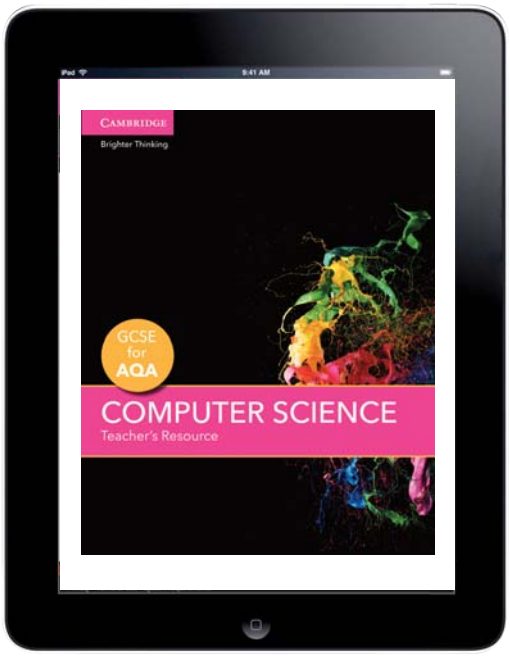

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AQA Teacher's Resource Cambridge Elevate enhanced edition	
9781316504116	FREE with purchase of Cambridge Elevate enhanced edition

AQA Teacher's Resource Free Online	
9781316504123	FREE PDF download from our website

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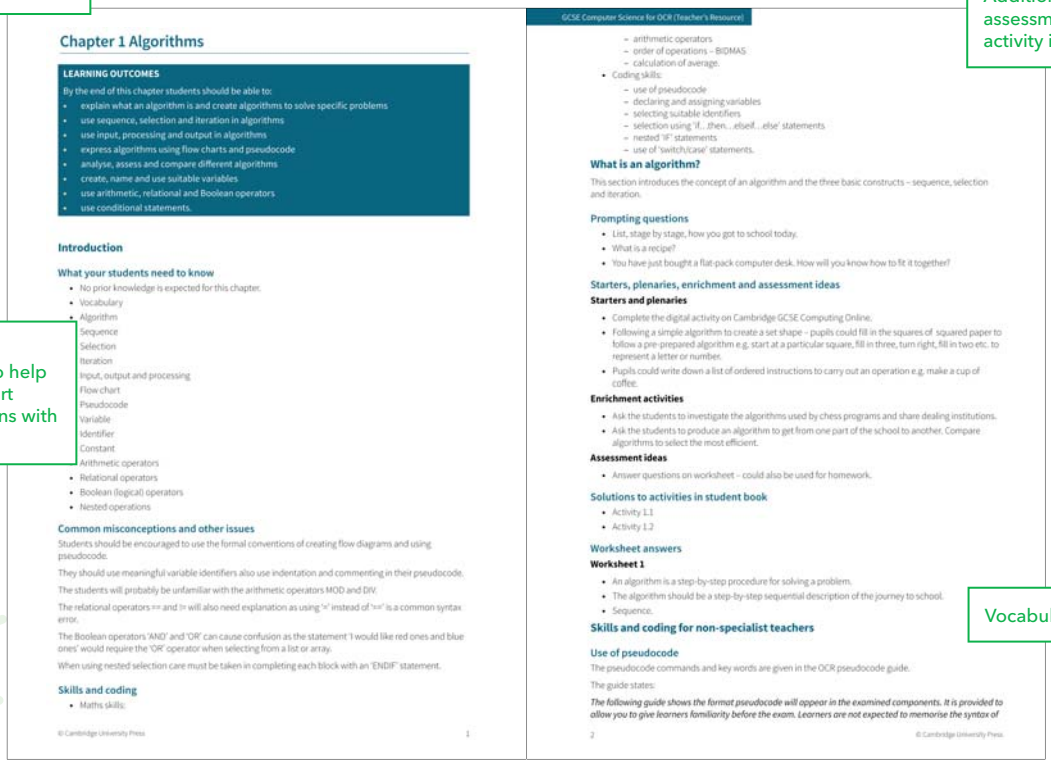
Additional assessment and activity ideas.

Vocabulary



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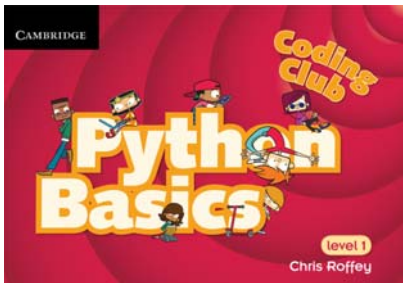
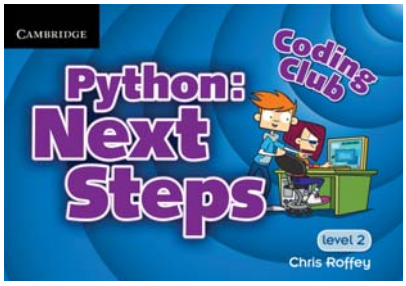
Key Stage 3 Coding Club





Coding Club

Chris Roffey

Coding is one of the most sought-after skills in today's job market. *Coding Club* is our unique series of coding books that guides young programmers to create their own versions of familiar games and apps. With clear explanation and step-by-step layout, the series starts at beginner level and works its way up over three levels:

- *Python: Basics* – introduces the world of coding and Python 3. Fun challenges and Quick Quizzes help consolidate new skills, and the companion website provides the full source code for all the projects and challenges, as well as help for readers
- *Python: Programming Art* – reinforces programming knowledge from *Python: Basics*
- *Python: Next Steps* – provides progressive tasks – like programming a working calculator – for students who are ready to move on to slightly more challenging material
- *Python: Interactive Adventures* – students reinforce their programming knowledge and learn how to code an ebook reader and a mystery game
- Python: *Building Big Apps* – following on from *Python: Next Steps*, this enhanced digital resource helps students with building larger, more exciting projects, such as the tennis game MyPong!

LEVEL 1	
Python: Basics	9781107658554
Python: Basics Cambridge Elevate enhanced edition (1 Year) School Site Licence	9781107495340
Python: Programming Art	9781107631090
Python: Programming Art Cambridge Elevate enhanced edition (1 Year) School Site Licence	9781107496477
LEVEL 2	
Python: Next Steps	9781107623255
Python: Next Steps Cambridge Elevate enhanced edition (1 Year) School Site Licence	9781107496422
NEW Python: Interactive Adventures Supplement 2	9781316634110
NEW Python: Interactive Adventures 2 (1 Year) School Site Licence	9781316634127
LEVEL 3	
Python: Building Big Apps	9781107666870
Python: Building Big Apps Cambridge Elevate enhanced edition (1 Year) School Site Licence	9781107496439

The code is suitable for Mac, Windows and Linux users and is compatible with the Raspberry Pi. Accessible online and on tablet devices through the Cambridge Elevate app.

Black Flag: A Coding Club Mission

Written to create coding interest, and build on knowledge and understanding of coding skills for Key Stage 3 students, *Black Flag* is no ordinary novel. It allows readers to play along with the story by completing a number of coding challenges via the FREE companion website (**cambridge.org/codingclub-blackflag**).

Black Flag: A Coding Club Mission
9781107671409

CEM
Centre for Evaluation & Monitoring

Centre for Evaluation and Monitoring

Inspired by teachers | Informed by evidence

At CEM, our aim is simple: we use world-class assessments and evidence to help teachers understand and support the children they work with.

Schools in 70 countries use our formative, adaptive assessments to strengthen UK and international education programmes for students aged 3-19, including GCSE, A Levels, Cambridge IGCSE™ qualifications and the IB Diploma. Teachers can understand more about each student's potential, track their progress and use the evidence to support good decision-making.

CEM is now part of the Cambridge family, joining Cambridge University Press and Cambridge Assessment in a shared vision of improving education for all.

Speak to your local consultant to learn more about how CEM can help your school.

A/AS Level Computer Science for OCR

A comprehensive suite of resources tailored to the OCR A/AS Level Computer Science specification. Our resources prepare students for the coursework component, demonstrate how computer science relates to everyday life, and support teachers in the transition from ICT to computer science.

- Created by an author team of practising teachers and industry advisors, including Computing At School master teachers
- A strong focus on independent learning, computational thinking, programming and problem-solving skills

A/AS Level Computer Science for OCR components

Student book

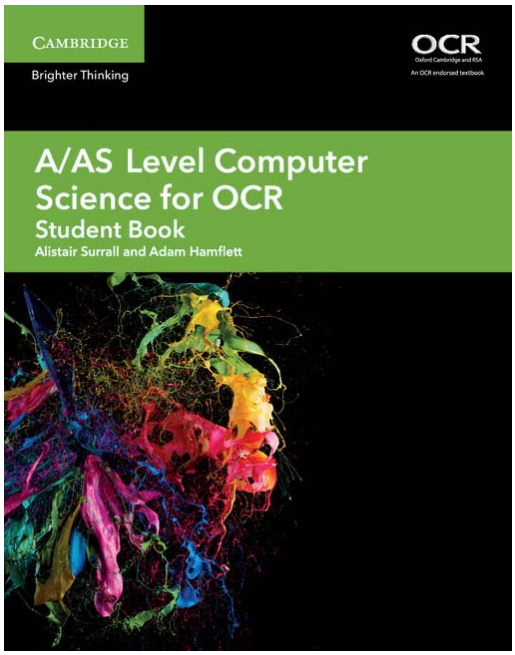
Combining Components 1 and 2 in one student book, this OCR endorsed resource:

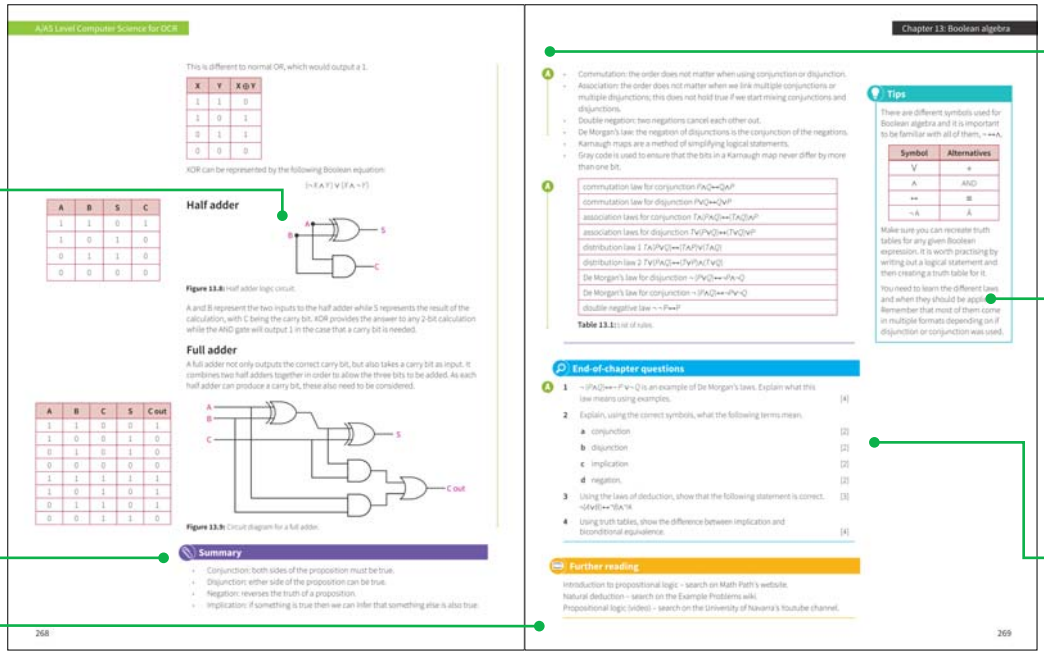
- Helps students build knowledge and master underlying principles and concepts of computer science
- Contains real-life scenarios demonstrating how computer science relates to everyday life
- Provides activities which give students plenty of opportunities to apply learning and investigate concepts
- Clearly flags AS and A Level content throughout

OCR Component 1 and 2 Student Book
9781108412711

OCR Component 1 and 2 Student Book with Cambridge Elevate enhanced edition (2 Years)
9781108412742

OCR Component 1 and 2 Student Book Cambridge Elevate enhanced edition (2 Years)
9781108412780





Clear diagrams
Visual representation of key concepts is important to help reinforce understanding.

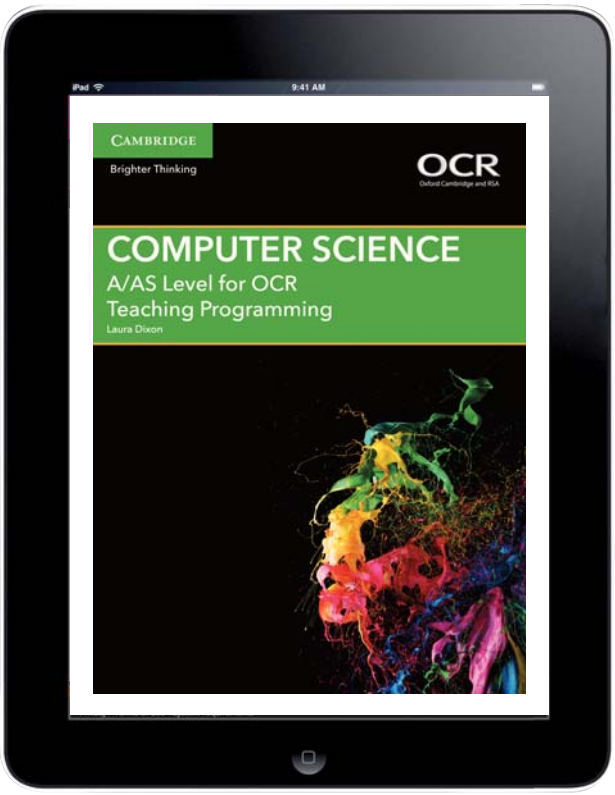
Summary
The summaries provide a clear recap of key topics and concepts learnt.

Further reading
Provides a list of additional sources where students can find further information on a particular topic.

A Level only icon
This icon indicates where material is specific to the A Level only. The green line extending from the icon clearly shows where the A Level only content starts and finishes.

Tip box
Provides useful guidance about particular types of code or software, as well as common errors to avoid and tips to help prepare for the exam.

End-of-chapter questions
Questions designed to test learning of the material in the chapter.



Teaching programming

- An OCR-endorsed resource for teachers offering complete support for Component 3 of the specification
- Features a progressive and structured series of problems and lesson plans to help prepare students for the practical aspects of the course
- Includes detailed lesson plans structured around a series of 20 differentiated problems progressing in difficulty, to stretch the more able and provide support for those who need it
- Model solutions in pseudocode for every question to support teaching in various programming languages used in the classroom

OCR Teaching Programming for Component 3 Cambridge Elevate enhanced edition (2 Years)
9781107465503

Teacher's resource

- Digital teacher's resources containing practical support and guidance

OCR Teacher's Resource Cambridge Elevate enhanced edition
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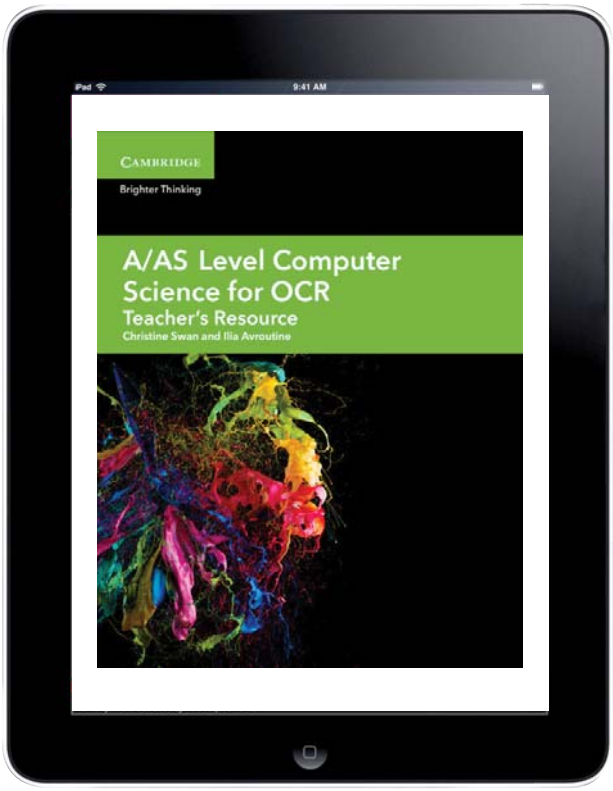
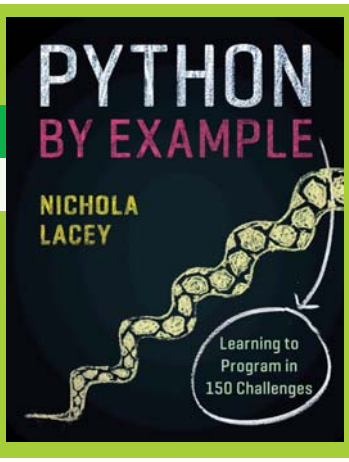


ALSO SEE

Python by Example
9781108716833



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A/AS Level Computer Science for WJEC/Eduqas

A comprehensive suite of resources tailored to the WJEC/Eduqas A/AS Level Computer Science specifications. Our resources prepare students for the coursework component, demonstrate how computer science relates to everyday life, and support teachers in the transition from ICT to computer science.

- Created by an author team of practising teachers and industry advisors, including Computing At School master teachers
- A strong focus on independent learning, computational thinking, programming and problem-solving skills

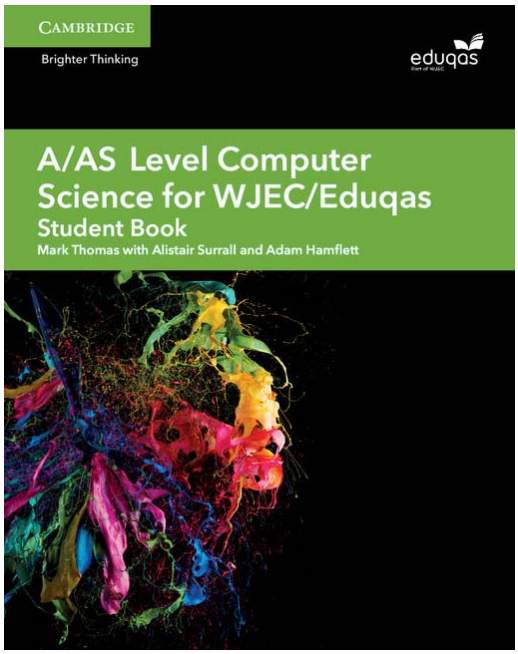
A/AS Level Computer Science for WJEC/Eduqas components

Student book

This student book has been written for the WJEC/Eduqas specifications and has been endorsed for the Eduqas specification. Combining Components 1 and 2 in one student book, this resource:

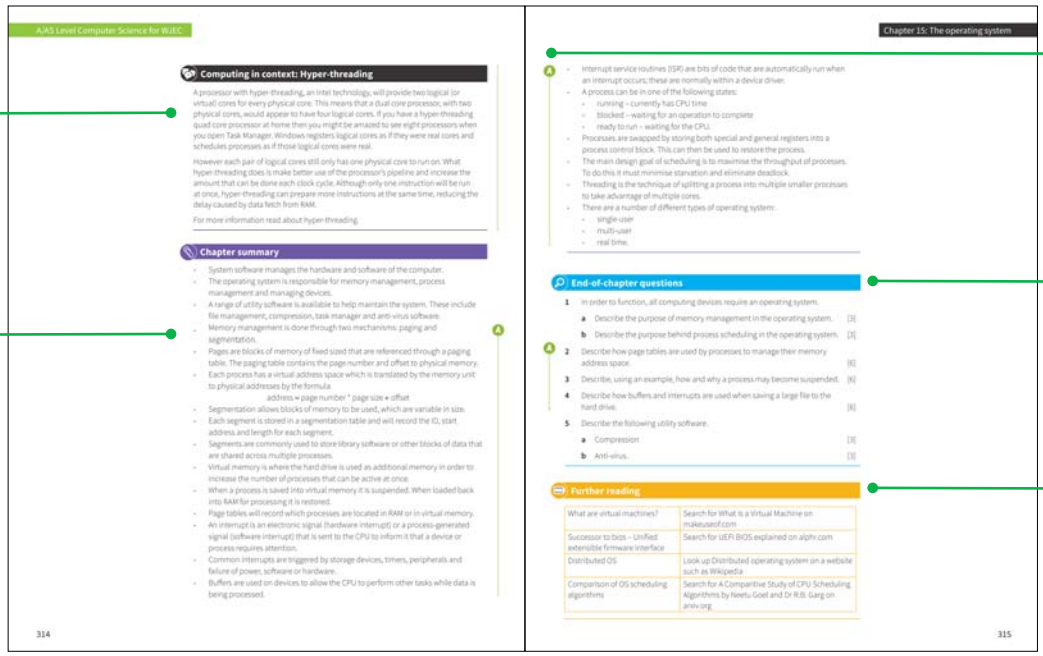
- Helps students build knowledge and master underlying principles and concepts of computer science
- Contains real-life scenarios demonstrating how computer science relates to everyday life
- Provides activities which give students plenty of opportunities to apply learning and investigate concepts
- Clearly flags AS and A Level content throughout

WJEC/Eduqas Component 1 and 2 Student Book
9781108412728
WJEC/Eduqas Component 1 and 2 Student Book with Cambridge Elevate enhanced edition (2 Years)
9781108412766
WJEC/Eduqas Component 1 and 2 Student Book Cambridge Elevate enhanced edition (2 Years)
9781108412797



Computing in context
Provides examples of how the concepts fit within real-life scenarios.

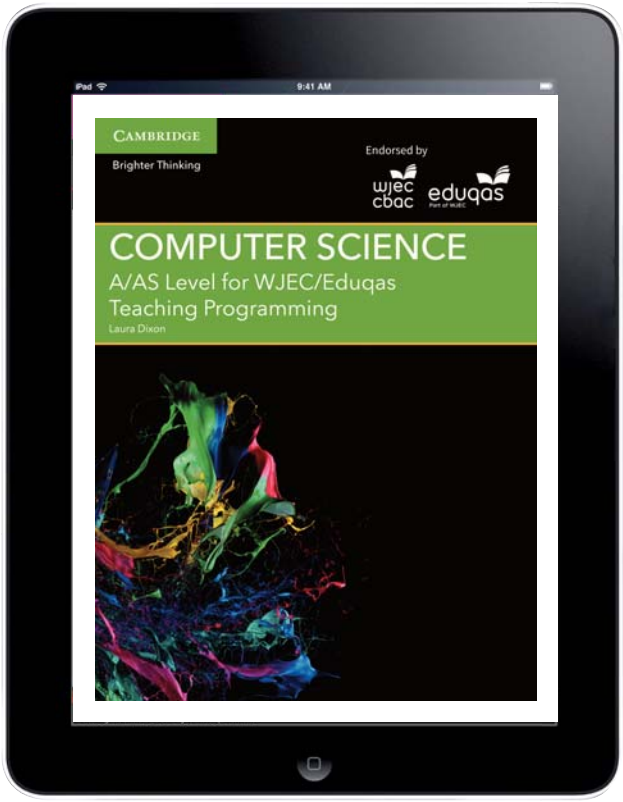
Summary
The summaries provide a clear recap of key topics and concepts learnt.



A Level only icon
This icon indicates where material is specific to the A Level only. The green line extending from the icon clearly shows where the A Level only content starts and finishes.

End-of-chapter questions
Questions are designed to test learning of the material in the chapter.

Further reading
Provides a list of additional sources where students can find further information on a particular topic.



Teaching programming

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WJEC/Eduqas Teaching Programming for Component 3 Cambridge Elevate enhanced edition (2 Years)
9781107549487

Teacher's resource

- Digital teacher's resources containing practical support and guidance

WJEC/Eduqas Teacher's Resource Cambridge Elevate enhanced edition
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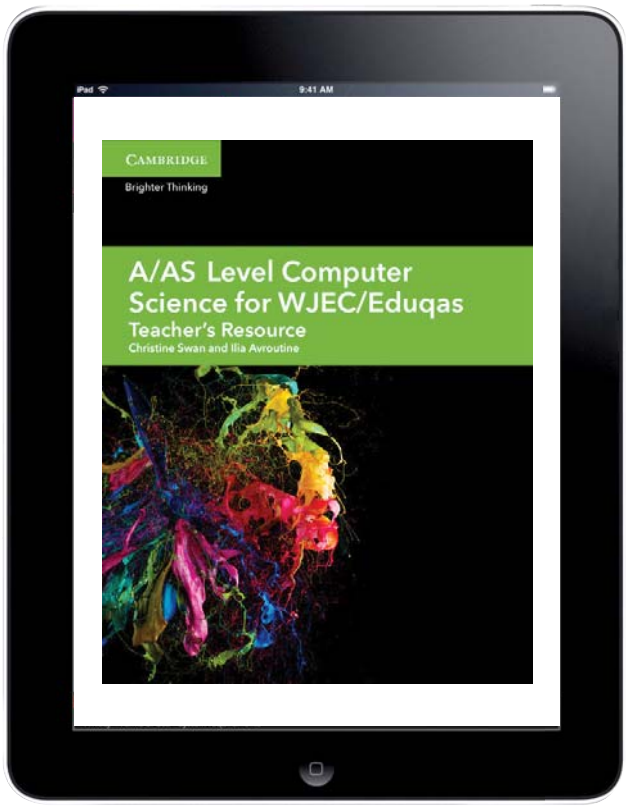
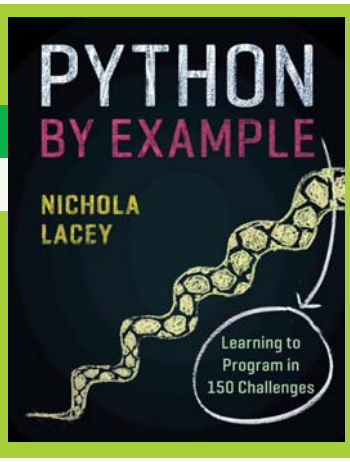


ALSO SEE

Python by Example
9781108716833



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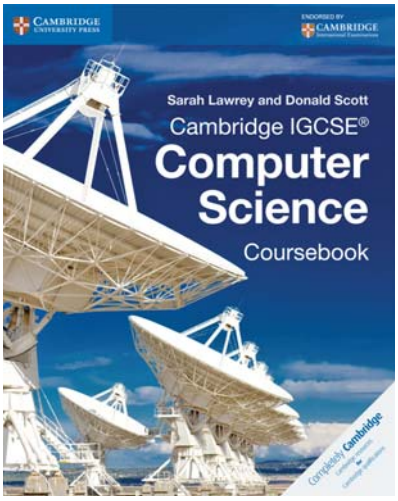

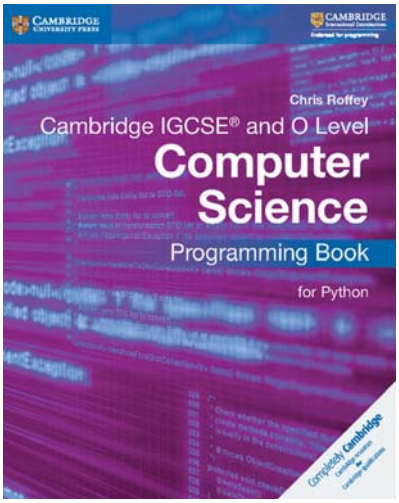

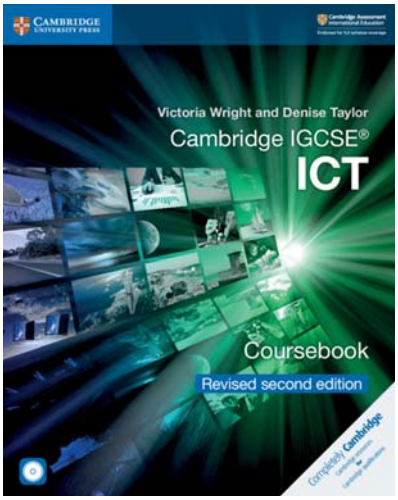

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Cambridge IGCSE™ and O Level Computer Science

Sarah Lawrey and Donald Scott

Cambridge IGCSE™ and O Level Computer Science syllabuses (0478/2210).

Coursebook

- Contains detailed explanations of concepts, with examples and tasks that help consolidate knowledge
- Introduces the foundations of programming that students need to learn, from data representation to algorithm design

Programming books

- Task-based learning builds up skills, guiding students through projects and providing examples of real coding solutions for students using Microsoft Visual Basic or Python

Coursebook	✓ 9781107518698
Coursebook Cambridge Elevate edition (2 Years)	✓ 9781316621073
Programming Book for Microsoft® Visual Basic	✓ 9781107518643
Programming Book for Python	✓ 9781316617823
Teacher's Resource CD-ROM	✓ 9781316611166
Revision Guide	✓ 9781107696341

Cambridge IGCSE™ ICT

Revised second edition
Victoria Wright and Denise Taylor

Cambridge IGCSE™ ICT syllabus (0471).

Coursebook

- Provides detailed coverage of the role and application of ICT in a rapidly changing world
- With clear theoretical explanations and complete coverage of the practical aspects of the syllabus
- Reflects the latest technologies in the field
- Contains an accompanying CD-ROM with source files so students can complete the practical tasks

Teacher's resource

- Provides you with differentiated activities, worksheets and extensive guidance

Coursebook with CD-ROM	✓ 9781108698061
Coursebook Cambridge Elevate edition (2 Years)	✓ 9781108727624
Teacher's Resource CD-ROM	9781316627419*

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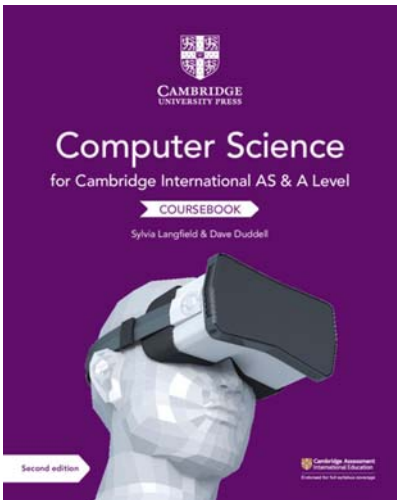


Cambridge International AS & A Level Computer Science

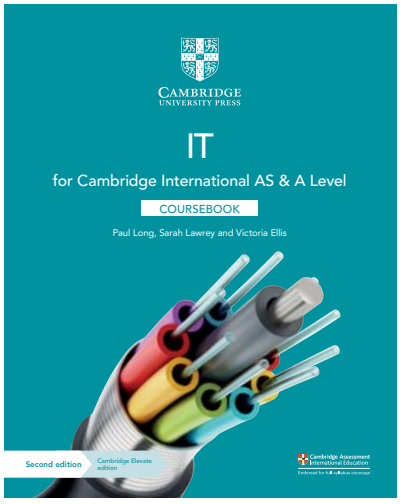
Second edition
Sylvia Langfield and Dave Duddell

Cambridge International AS & A Level Computer Science syllabus (9618) for examination from 2021.

Get your students learning about everything from simple systems to designing algorithms and problem-solving.

- Provides students with detailed descriptions of concepts, reinforced with examples that outline complex subject matter in a clear way
- Alongside fundamental definitions, higher level programming skills are developed through the explanation of processes and consolidated by practical exam-type questions
- Programming support has been introduced to reflect the replacement of Pascal/Delphi with Java for the new syllabus

Coursebook	✓ 9781108733755
Coursebook Cambridge Elevate edition (2 Years)	✓ 9781108700412
Coursebook with Cambridge Elevate edition (2 Years)	✓ 9781108568326
Cambridge Elevate Teacher's Resource Access Card	✓ 9781108716093
Revision Guide	● 9781108737326



Cambridge International AS & A Level IT

Second edition
Paul Long, Sarah Lawrey and Victoria Ellis

Cambridge International AS & A Level IT syllabus (9626) for examination from 2022.

- Detailed explanations of concepts supported by examples, activities and highlighted key vocabulary
- Learning objectives, self-assessment, end-of-unit progress checks and reflection features encourage students to keep track of their own progress and develop into independent learners
- Exam-style questions and a practical workbook provide a wealth of opportunities to practise in class and at home

Coursebook with Cambridge Elevate edition	● 9781108782470
Coursebook Cambridge Elevate edition	● 9781108749329
Practical IT Skills Workbook with Cambridge Elevate edition	● 9781108782562
Cambridge Elevate Teacher's Resource Access Card	● 9781108812160

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