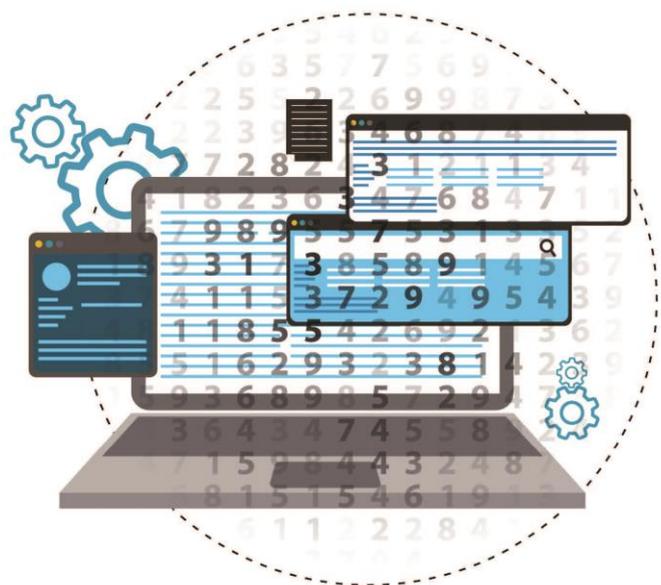


Next Steps

Cambridge IGCSE™ Computer Science 0478 and Cambridge International AS & A Level Computer Science 9618

For Cambridge IGCSE examination from 2020-21

For Cambridge International AS & A Level examination from 2021



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Contents

Introduction	4
Frequently asked questions by learners.....	5
Skills, topics and assessment.....	8
Resources.....	14
Suggested classroom activity	15
Bridging exercise	18

Introduction

The focus of this guide is on moving on from teaching and studying the **Cambridge IGCSE™ Computer Science 0478** syllabus to the **Cambridge International AS & A Level Computer Science 9618** syllabus.

This guide will help you and your learners:

- understand what to expect when starting the AS & A Level course
- prepare for the AS & A Level course
- think about ways to achieve success and gain confidence.

You may be using this document at the end of the academic year for Cambridge IGCSE Computer Science or at the start of the academic year for Cambridge International AS & A Level Computer Science. Either way, the aim is to motivate and inspire learners. If there is to be a time gap between delivering this session and starting the Cambridge International AS & A Level course, then the aim is for every learner to look forward to the new course positively.

This Introduction, the Resources and Suggested classroom activity sections of this guide are written directly for you, the teacher. The rest of this guide has been written to make it easy for you to adapt and reproduce the content for use by your learners.

Frequently asked questions by learners

Listed below are some questions which learners frequently ask. The answers to each of the questions below are written as a direct communication to your learners. You could copy and paste these to make a PowerPoint, read them out to your group, or produce a booklet for them to read through and discuss.

Is it helpful to have taken the Cambridge IGCSE Computer Science course?

Yes. The move from Cambridge IGCSE to Cambridge International AS & A Level has been designed to be as smooth a transition as possible. Many of the topic headings are the same so you will already be familiar with the topic and will just progress from there. The style of questions may be similar and the skills you have developed will be useful.

What extra work will I have to do, if I have not taken Cambridge IGCSE Computer Science?

This will depend on the course you have taken. Many learners without a Cambridge IGCSE background have the same skills and subject knowledge and generally adjust quickly to the 'Cambridge' style when they start their AS & A Level.

You may not have covered some topics that are a useful base for Cambridge International AS & A Level. This is not a problem – you will probably find that your teacher goes over some Cambridge IGCSE work as a start to a new Cambridge International AS & A Level topic, or if not, you can easily develop your research skills and read up what you need to know. You will find that teaching yourself subject matter at Cambridge IGCSE level is much easier when you are working to a higher level.

What is the syllabus?

The syllabus for Cambridge International AS & A Level Computer Science 9618 is a complete description of the content, examinations and what you need to do to be successful in the qualification. '9618' is the reference number of the Computer Science syllabus.

Your teacher may give you a copy of the subject content of the syllabus; or go to the Cambridge website at www.cambridgeinternational.org/9618 for the full copy of the syllabus.

How do I make the transition from Cambridge IGCSE Computer Science to Cambridge International AS & A Level Computer Science?

This guide will help you prepare for the transition, so there are no surprises in what to expect.

You may find you hardly notice the transition to Cambridge International AS & A Level, or you may find it more difficult to adjust at first and need a bit of time to settle into the new course. Try and assess your own situation and then decide your best course of action.

What are the differences?

Some of the main differences you will find when you study Cambridge International AS & A Level compared to Cambridge IGCSE are listed in the table below.

Fewer subjects	Hopefully you will have chosen the subjects that you really enjoy, are really good at or those which you need to take you on to university and/or your chosen career.
Smaller classes	You will have an opportunity to contribute more to lessons and have more one-to-one interaction with your teacher. You will have more lessons each week: the recommended number of guided learning hours for Cambridge IGCSE Computer Science is 130 compared with 180 guided learning hours for AS Level and 360 learning hours for the full A Level qualification.
Detailed and specialist content	You will find increased challenge as you study in greater depth, work more independently and begin to develop your own ideas. You will be able to explore topics in much more depth than at Cambridge IGCSE, maybe finding answers to questions that were unanswered at that level and learning about certain topics which are completely new.
Independent study	Greater independence is a key part of Cambridge International AS & A Level qualifications which helps prepare you for study at university. It is important that you use this independent study time well. You can use this time in a variety of constructive ways – for completion of homework tasks, assignments, research or for completing additional reading around the subject.
Revision	Try to build in some time for revision throughout the course; consolidating and learning notes as you go along makes it much easier to remember when it comes to examination time.
Read around your subject	Use a range of textbooks and internet sites, though you will probably find the Cambridge-endorsed textbooks the most helpful.
Take notes	When you take notes, try to summarise the main information that you need. Use headings and bullet points to reduce the content, and colours to highlight key pieces of information. If using the internet, don't just print pages of information; make notes from them or highlight text to show the key points. Always use your own words where possible.
Independent research	You might have completed some wider reading tasks at Cambridge IGCSE level but you can expect this to be a more regular feature of homework tasks. Ask your teacher for a recommended list of textbooks and websites that you can use so you have a good starting point. Save useful websites to your Favourites bar so you know where to find them again.

Folders	You will probably move from exercise books to folders to record your learning and it is important to be organised. Divide your folder into topic sections and keep your notes in date order. Keep copies of past questions, mark schemes and example answers alongside any completed assessed work. Highlight examination advice in your notes and keep key documents about examinations in a separate section of your folder.
Command words	These are the words in an exam question that explain to you what you need to do such as: describe, explain, state, evaluate. You may well have underlined these when looking at example examination questions. At Cambridge International AS & A Level, you may be introduced to some new command words. You could start your own glossary too.
Assessment	You need to know: what examinations you will sit; how long each examination is; whether you have a choice of questions or not; how many marks each question and paper carries and what the structure of the questions is like. It is a good idea to have an assessment overview and copies of past papers and mark schemes.
Key concepts	<p>You will be introduced to key concepts that help you to develop a deeper understanding of the subject and make links between the different areas of the syllabus.</p> <p>The key concepts for Cambridge International AS & A Level Computer Science are:</p> <ul style="list-style-type: none">• Computational thinking• Programming paradigms• Communication• Computer architecture and hardware• Data representation and structures

Skills, topics and assessment

What are the skills needed for the Cambridge International AS & A Level course?

For the examinations taken at Cambridge International AS & A Level, you will be assessed on assessment objectives (AOs) which detail the skills and knowledge you need to display in order to fulfil the requirements of the qualification. These skills are divided into three main groups:

AO1 Demonstrate knowledge and understanding of the principles and concepts of computer science, including abstraction, logic, algorithms and data representation

AO2 Apply knowledge and understanding of the principles and concepts of computer science, including to analyse problems in computational terms

AO3 Design, program and evaluate computer systems to solve problems, making reasoned judgements about these

How will I be assessed?

The Cambridge International AS & A Level examination consists of four papers. You need to answer all the questions on the papers – there is no element of choice. For the AS Level qualification you take one theory paper, which contains some questions with short answers and some with longer answers, and one problem-solving and programming paper, for which you write answers in pseudocode. For the A Level, there are two more papers: one theory paper, with both short and long-answer questions and one practical paper. The practical paper is taken on a computer and you will need to program solutions to the questions without access to the internet or email.

What topics will be studied?

Cambridge IGCSE Computer Science 0478 serves as a foundation for Cambridge International AS & A Level Computer Science 9618 which prepares learners for the study of computer science at university. There are some areas of the Cambridge International AS & A Level syllabus which you will already have studied and some areas that will be new to you. The table below shows the main areas of progression between the Cambridge IGCSE and the Cambridge International AS & A Level syllabus.

Where topics are completely new, there may be more key words and you may need to read around these topics more widely to consolidate your knowledge and understanding.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Information representation	
Introduction to binary numbers, and conversion between positive denary, binary and hexadecimal integer values.	Introduction to Binary Coded Decimal (BCD) to represent positive integer values, converting values to and from one's complement and two's complement to represent negative integers. Performing binary addition and subtraction. This extends to representing decimal numbers and the use of floating-point number representation.
Show understanding of binary quantities such as a bit and byte.	The difference between binary and denary prefixes is explored and how these affect the binary quantities.
Show understanding that sound (music), pictures (images), video and text are stored in different	How other types of data are represented in a computer, including character sets, sound waves

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
formats.	and images.
Show an understanding that data compression is needed, including the difference between lossy and lossless compression, applied to sound, images and text files.	This extends to justifying the method used in a situation, and explaining how a specific file (text, image or sound) will be compressed, including how run-length encoding compresses these different types of file.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Communication	
Show understanding of what is meant by the transmission of data.	Examine the purpose and benefits of data transmission and the networking of devices.
	Explore the different types of network that are set up including LAN (local area network) and WAN (wide area network), client-server and peer-to-peer models of network.
	Study different topologies for networks including the bus, star, mesh and hybrid topologies.
Explore the different types of transmission including serial vs parallel, simplex vs duplex vs half-duplex, and be able to justify their use in specific scenarios.	Learn the difference between wired and wireless networks and the different characteristics of the data transmission methods. How Ethernet works with collision detection.
Detect errors in data transmission and how parity bits are used to check for errors.	Examine errors during data transfer in security, privacy and data integrity along with parity blocks and checksums.
Show understanding of the security risks associated with the internet and how to prevent some of these threats.	Show understanding of the threats to computers and describe the methods that can be used to limit these risks, including an understanding of encryption.
Show understanding of the use of the internet including the role of the browser, an Internet Service Provider (ISP) and HTML as well as an understanding of Internet Protocol (IP) address, Uniform Resource Locator (URL) and cookies.	Examine the hardware that supports the internet and the format and use of IP addresses. Extend Cambridge IGCSE knowledge to explore the role of a Domain Name Service (DNS) with URLs.
	Explore the hardware required to set up and support a LAN including the role of a router.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Hardware	
Understand logical operations and their related	This extends to creating the related circuit, truth table and/or logic expression from a given problem

Next Steps

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
logic gates and truth tables.	statement, expression, circuit and/or truth table.
Understand operation principles of a range of input and output devices and select appropriate devices for a scenario.	Explore input and output devices, as well as their use in embedded systems and monitoring and control systems.
Explore the purpose of primary and secondary memory including Random Access Memory (RAM), Read Only Memory (ROM) and secondary storage.	Extend understanding of memory, including buffers and the different types of RAM and ROM.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Processor fundamentals	
Understand the Von Neumann model.	Explore the purpose of the individual registers within the Von Neumann model.
	Show understanding of the components within a processor including the purpose and roles of the arithmetic logic unit, control unit and system clock as well as the different buses.
Understand the fundamental principles of the fetch-execute cycle.	Explore the use of registers in fetch-execute cycles and the use of register transfer notation to describe these processes.
Understand the need for interrupts.	Explore the causes of interrupts and how interrupts are handled using an Interrupt service routine.
Explore the use of hexadecimal in assembly languages, and understand the need for an assembler to translate assembly programs to machine code.	Study assembly language including the different types of addressing, and trace simple assembly language programs.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
System software	
Study the purpose of an operating system – what it is and why it is required.	Study the purpose of an operating system and explore the management tasks performed by an operating system.
	Explore the purpose of typical utility software.
Explore the use of library routines in programs, making use of them in your own programs.	Study the purpose and use of program libraries.
Explore the need for compilers, interpreters and assemblers when writing programs.	Explore the use of compilers, interpreters and assemblers as well as the relative merits and drawbacks of each, as well as how some programs

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
	may be partially compiled and interpreted.
	Study the use of an Integrated Development Environment in the development of programs.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Security	
Study the need to keep computers and data safe from both accidental damage and malicious actions.	Explore the need for security of data and computers.
Explore the different ways that data can be kept safe.	Explore a greater range of methods of keeping data and computer safe.
Study the need for validation and verification and implement these on input data.	Explore methods of protecting the integrity of data including the use of validation and verification on both data entry and data transfer.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Ethics and ownership	
Show understanding of ethics, primarily looking at copyright and plagiarism.	Continue to explore the need for copyright.
Show understanding of software licences and the different categories.	Introduction to a greater range of licences that must be selected from and justified for a scenario.
	Study the need for and purpose of ethics in the computing profession and explore scenarios.
	Explore Artificial Intelligence and its applications.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Databases	
Study the use of a single-table database, analysing data types and selecting appropriate primary keys.	Explore the problems with file-based approaches and how a relational database can overcome these. Learn how to design a suitable database structure and how to use a Database Management System (DBMS) to perform actions such as adding, editing data or performing searches.
Use query-by-example to search for data.	Explore Structured Query Language (SQL) and use it to create and amend tables as well as search for data.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Algorithm design, problem-solving, data types and programming	
Study how to split a program down into sub-systems.	Explore computational thinking including the decomposition of a problem and abstraction.
Write a program in a high-level language and pseudocode, including: <ul style="list-style-type: none"> • input and output • variables and constants • BOOLEAN and mathematical operators • selection • iteration. 	Explore the use of pseudocode in the design of programs. Extend knowledge of using the constructs introduced in Cambridge IGCSE.
Trace and use flowcharts to produce a design for an algorithm.	Continue to read and develop flowcharts to represent programs.
Study the different data types that exist in a program and when these are the most appropriate to use.	Continue to make use of the data types introduced at Cambridge IGCSE and also explore the use of records and files to store data. Extend to abstract data types and explore how data are added to and removed from the different forms of data type.
Use a 1D array to store and access data.	Continue to use 1D arrays but also explore the use of 2D arrays.
	Learn about standard algorithms to search and sort data.
Make use of predefined procedures/functions and library programs.	Study the different types of procedures/functions that can be developed. Make use of these in programs and write own procedures/functions for a given scenario using pseudocode.

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
Software development	
Learn how to use top-down design including the development of structure charts.	Continue to use structure charts but also explore using these to identify sub-tasks and the passing of parameters between different modules/procedures/functions.
Learn how to identify an error in an algorithm and explore the correction of errors.	Learn about the different types of error that can exist in a program; syntax, logic and run-time errors.
Learn how to suggest appropriate test data for a given program.	Learn how to complete test plans including normal, abnormal and extreme data. Also explore the different types of testing that can be carried out

Cambridge IGCSE Computer Science 0478	Cambridge International AS & A Level Computer Science 9618
	during the development of a program.

Resources

Although some of the resources for Cambridge International AS & A Level are similar to those for Cambridge IGCSE such as past papers and endorsed textbooks, some topics in all of the papers will be new. Reading widely and learning new skills are part of the challenge for learners of stepping up to Cambridge International AS & A Level Computer Science.

Past/specimen papers and mark schemes

Past examination papers and specimen papers provide opportunities for learners to become familiar with the assessment requirements of the course. Learners should try to get as much practice as they can before their final exams.

Textbooks

There is a wide variety of textbooks available, some which cover the entire course and others which specialise in certain areas of study. Give your learners a list of suggested reading materials. There are endorsed textbooks under development for the course; please check the website below.

To find a list of the endorsed textbooks go to www.cambridgeinternational.org

Websites

There are some specific AS & A Level Computer Science revision sites which are great to use. You can also use general search engines to find information, although some sites might be more relevant than others. Sometimes, teachers put lesson presentations on the internet too. Remember to check all internet resources for suitability, making sure that the content is relevant for your syllabus. Some websites match a certain syllabus. That does not mean that they are not useful, you will just need to be selective about the topics that you choose from them.

www.cambridgeinternational.org (access to syllabus, past papers and mark schemes)

Paper 1 and Paper 2:

<https://student.craigndave.org/a-level-videos>
www.tutorialspoint.com/data_structures_algorithms/dsa_queue.htm
www.tutorialspoint.com/data_structures_algorithms/stack_algorithm.htm
www.w3schools.com/sql/
www.yorku.ca/sychen/research/LMC/
www.geeksforgeeks.org/functions-of-operating-system/
www.sqa.org.uk/e-learning/MDBS01CD/page_26.htm

Paper 3 and Paper 4:

<https://student.craigndave.org/a-level-videos>
www.tutorialspoint.com/data_structures_algorithms/dsa_queue.htm
www.tutorialspoint.com/data_structures_algorithms/stack_algorithm.htm
www.tutorialspoint.com/data_structures_algorithms/linked_list_algorithms.htm
www.teach-ict.com/as_as_computing/ocr/H447/F453/3_3_2/lexical_syntax_analysis/miniweb/pg8.htm
www.forbes.com/sites/robertadams/2017/01/10/10-powerful-examples-of-artificial-intelligence-in-use-today/#63fa0199420d

Suggested classroom activity

You could use the plan below to deliver a lesson that supports the transition to AS & A Level study.

Subject: Development of procedures		Syllabus reference: 11.3 Structured programming. Define and use a procedure. Explain where in the construction of an algorithm it would be appropriate to use a procedure.
Lesson objectives: To discuss the key characteristics of a procedure To learn how to identify when it is appropriate to use a procedure To practise writing a procedure	Lesson outcomes: To be able to identify the key characteristics of a procedure To be able to identify when a procedure should be used To be able to write a procedure and call it from another part of the program	
Introduction: Show learners a program with a lot of repeated code within it, for example outputting the same text (such as a menu) repeatedly. Ask learners why the program is inefficient.	Resources: Need two example programs that have repeated use of code ideally through just input and output i.e. no parameter use.	
Main activities: <ul style="list-style-type: none"> • Discuss the key characteristics of a procedure including how it does not return any values, it just runs and then returns control to the part of the program that called it. <i>Do not introduce parameters in this lesson.</i> • Demonstrate how to select an appropriate identifier for a procedure using the example from the introduction. Show learners how the repeated code is moved into the procedure and how it is called by one procedure call for each section where the code is repeated. • Ask learners to create the program including procedure in your chosen high-level programming language. • Put learners into pairs and give them a second program with repeated code. Ask them to work together to identify how one or more procedures could be used in the program. • Select pairs to explain their answer and discuss the different answers that learners may have. • Learners work individually to create the program including procedures that need to be called instead of the repeated code. Homework: Ask learners to revisit a program they have previously written and to add procedures and bring the new code to the next lesson to explain where and why they used a procedure.		
Organisation: Learners work in pairs with the second example program but then create it individually.	Plenary: Show learners an example program and ask them to find the identifier of the procedure, the line numbers where the procedure is called etc.	

<p>Subject: Development of procedures</p> <p style="text-align: right;">Syllabus reference: 11.3 Structured programming.</p> <p style="text-align: right;">Define and use a procedure. Explain where in the construction of an algorithm it would be appropriate to use a procedure.</p>	
<p>Challenge:</p> <p>Ask learners to explore how data can be sent to a procedure (parameters).</p>	<p>Assessment opportunities:</p> <ul style="list-style-type: none"> Paired feedback Final programs Answers to plenary

Example Program 1 in pseudocode (to be converted into a high level language)

This is the first part of a program that is being developed. Learners do not need to be concerned that it is incomplete, as it already needs the use of procedures.

```

OUTPUT "You are at the start"
OUTPUT "Would you like to move up, down, left or right?"
INPUT direction
IF direction = "up" THEN
  OUTPUT "You have hit a wall"
  OUTPUT "You are at the start"
  OUTPUT "Would you like to move up, down, left or right?"
  INPUT direction
ELSEIF direction = "down" THEN
  OUTPUT "You have moved down"
  OUTPUT "There is no exit here"
  OUTPUT "Would you like to move up, down, left or right?"
  INPUT direction
ELSEIF direction = "left" THEN
  OUTPUT "You have hit a wall"
  OUTPUT "You are at the start"
  OUTPUT "Would you like to move up, down, left or right?"
  INPUT direction
ELSEIF direction = "right" THEN
  OUTPUT "You have moved right one space"
  OUTPUT "There is no exit here"
  OUTPUT "Would you like to move up, down, left or right?"
  INPUT direction
ENDIF
    
```


Bridging exercise

Note for teachers

This activity is designed to follow on from the learning in the classroom activity. It makes use of a specimen question to give an indication of how each learner has gained knowledge and understanding from completing the earlier activity. Learners may need access to one of the endorsed textbooks. They will also need a copy of Question 5(c) from 9608 June 2018 Paper 21 and accompanying mark scheme. These are available from the [School Support Hub](#). As this is the first activity they have attempted, it would be a good idea to pair learners together, providing each with a study partner for support.

Learner task

You will now have completed your classroom activity and hopefully you have enjoyed learning about procedures. You are going to complete the following activity to give you an idea of how you might work independently as part of the Cambridge International AS & A Level Computer Science course. Make sure that you first use your resources, then your partner and lastly your teacher for support.

Aim: We want you to answer an AS Level question that requires you to write a procedure.

- Look at the past question you have been given – Question 5(c) – and underline the key terms and command words. Make sure that you understand what the question is asking you to do before you start.
- Work with your study partner to read through the list of actions that must be performed in the procedure.
- Work with your study partner to plan your answer and to write a first draft for the question using pseudocode. Remember, this is the first time that you have seen an AS Level question so don't worry if you find it challenging at this stage.
- Now look at the mark scheme provided to self-assess your first draft. Answer these questions:
 - Which mark points did you meet?
 - Which aspects of the mark scheme did you not include?Add any corrections or missing parts to your answer in a different colour. If there is anything that you are not sure about, chat to your study partner about it or ask your teacher.
- Fasten all your work together and submit it to your teacher. You have successfully written a procedure and your first response to an AS Level-standard question. Great work!

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