Cambridge Assessment
International Education

Syllabus

Cambridge International AS & A Level
Information Technology 9626

Use this syllabus for exams in 2022, 2023 and 2024.
Exams are available in the June and November series.
Exams are also available in the March series in India only.

Cambridge Pathway

Why choose Cambridge International?

Cambridge International prepares school students for life, helping them develop an informed curiosity and a lasting passion for learning. We are part of the University of Cambridge.

Our Cambridge Pathway gives students a clear path for educational success from age 5 to 19. Schools can shape the curriculum around how they want students to learn – with a wide range of subjects and flexible ways to offer them. It helps students discover new abilities and a wider world, and gives them the skills they need for life, so they can achieve at school, university and work.

Our programmes and qualifications set the global standard for international education. They are created by subject experts, rooted in academic rigour and reflect the latest educational research. They provide a strong platform for students to progress from one stage to the next, and are well supported by teaching and learning resources.

We review all our syllabuses regularly, so they reflect the latest research evidence and professional teaching practice – and take account of the different national contexts in which they are taught.

We consult with teachers to help us design each syllabus around the needs of their learners. Consulting with leading universities has helped us make sure our syllabuses encourage students to master the key concepts in the subject and develop the skills necessary for success in higher education.

Our mission is to provide educational benefit through provision of international programmes and qualifications for school education and to be the world leader in this field. Together with schools, we develop Cambridge learners who are confident, responsible, reflective, innovative and engaged – equipped for success in the modern world.

Every year, nearly a million Cambridge students from 10 000 schools in 160 countries prepare for their future with the Cambridge Pathway.

'We think the Cambridge curriculum is superb preparation for university.'

Christoph Guttentag, Dean of Undergraduate Admissions, Duke University, USA

Quality management

Cambridge International is committed to providing exceptional quality. In line with this commitment, our quality management system for the provision of international qualifications and education programmes for students aged 5 to 19 is independently certified as meeting the internationally recognised standard, ISO 9001:2015. Learn more at **www.cambridgeinternational.org/ISO9001**

Contents

Changes to this syllabus

For information about changes to this syllabus for 2022, 2023 and 2024, go to page 50.

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1 Why choose this syllabus?

Key benefits

The best motivation for a student is a real passion for the subject they're learning. By offering students a variety of Cambridge International AS & A Levels, you can give them the greatest chance of finding the path of education they most want to follow. With over 50 subjects to choose from, students can select the ones they love and that they're best at, which helps motivate them throughout their studies.

Following a Cambridge International AS & A Level programme helps students develop abilities which universities value highly, including:

- a deep understanding of their subjects
- higher order thinking skills – analysis, critical thinking, problem solving
- presenting ordered and coherent arguments
- independent learning and research.
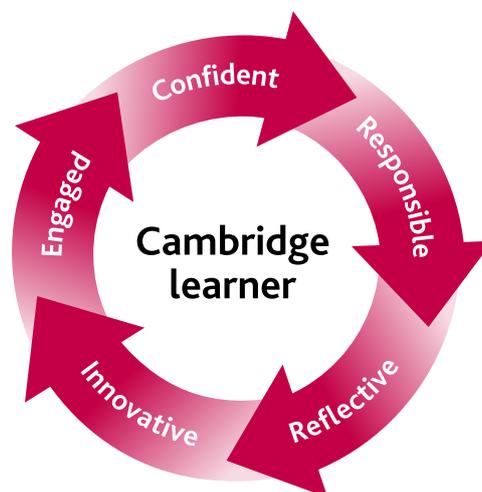
Cambridge International AS & A Level Information Technology encourages learners to meet the needs of Higher Education courses in Information Technology as well as employers.

Information Technology (IT) is the application of technology to process information. In a world where IT is constantly changing, individuals increasingly need technological and information literacy skills that include the ability to gather, process and manipulate data.

The impact of IT on society is enormous and as the percentage of businesses and households connected to communication networks such as the internet grows, so does the need for individuals who understand these new technologies.

This syllabus encourages learners to become effective and discerning users of IT. It helps them to develop a broad range of IT skills, knowledge and understanding. Learners study the structure and use of IT systems within a wide range of organisations, including the use of a variety of computer networks. As a result, learners gain an understanding of IT system life cycles, and how these affect the workplace. They also learn about the wider impact of IT on society in general. At A Level, learners also study simple programming for the web relevant to their own use of IT.

Our approach in Cambridge International AS & A Level Information Technology encourages learners to be:

confident, using a range of software

responsible, using technology ethically

reflective, as learners, developing their knowledge and understanding of IT to solve problems

innovative, creating efficient solutions to problems

engaged, in technology, how it is built and how software solutions are developed.

Key concepts

Key concepts are essential ideas that help students develop a deep understanding of their subject and make links between different aspects. Key concepts may open up new ways of thinking about, understanding or interpreting the important things to be learned.

Good teaching and learning will incorporate and reinforce a subject's key concepts to help students gain:

- a greater depth as well as breadth of subject knowledge
- confidence, especially in applying knowledge and skills in new situations
- the vocabulary to discuss their subject conceptually and show how different aspects link together
- a level of mastery of their subject to help them enter higher education.

The key concepts identified below, carefully introduced and developed, will help to underpin the course you will teach. You may identify additional key concepts which will also enrich teaching and learning.

The key concepts for Cambridge International AS & A Level Information Technology are:

- **Impact of IT**
  The application of technology to process information impacts all aspects of our lives. The enormity of the impact can be seen in industry and commerce, transport, leisure, medicine, in the workplace and the home. Communications using technologies have made the world seem smaller.

- **Hardware and software**
  Hardware and software interact with each other in an IT system. It is important to understand how these work, and how they work together with each other and with us in our environment.

- **Networks**
  Computer systems can be connected together to form networks allowing them to share data and resources. The central role networks play in the internet, mobile and wireless applications and cloud computing has rapidly increased the demand for network capacity and performance.

- **The internet**
  The internet is a global communications network that uses standardised communications protocols to allow computers worldwide to connect and share information in many different forms. The impact of the internet on our lives is profound. While the services the internet supports can provide huge benefits to society they have also introduced issues, for example security of data.

- **System life cycle**
  Information systems are developed within a planned cycle of stages that cover the initial development of the system and continue through to its scheduled updating or redevelopment.

- **New technologies**
  As the information industry changes so rapidly, it is important to keep track of new and emerging technologies and consider how they might affect everyday life.

'Cambridge students develop a deep understanding of subjects and independent thinking skills.'

Principal, Rockledge High School, USA

International recognition and acceptance

Our expertise in curriculum, teaching and learning, and assessment is the basis for the recognition of our programmes and qualifications around the world. Every year thousands of students with Cambridge International AS & A Levels gain places at leading universities worldwide. They are valued by top universities around the world including those in the UK, US (including Ivy League universities), Europe, Australia, Canada and New Zealand.

UK NARIC, the national agency in the UK for the recognition and comparison of international qualifications and skills, has carried out an independent benchmarking study of Cambridge International AS & A Level and found it to be comparable to the standard of AS & A Level in the UK. This means students can be confident that their Cambridge International AS & A Level qualifications are accepted as equivalent, grade for grade, to UK AS & A Levels by leading universities worldwide.

Cambridge International AS Level Information Technology makes up the first half of the Cambridge International A Level course in Information Technology and provides a foundation for the study of Information Technology at Cambridge International A Level. Depending on local university entrance requirements, students may be able to use it to progress directly to university courses in Information Technology or some other subjects. It is also suitable as part of a course of general education.

Cambridge International A Level Information Technology provides a foundation for the study of Information Technology or related courses in higher education. Equally it is suitable as part of a course of general education.

For more information about the relationship between the Cambridge International AS Level and Cambridge International A Level see the 'Assessment overview' section of the Syllabus overview.

We recommend learners check the Cambridge recognitions database and the university websites to find the most up-to-date entry requirements for courses they wish to study.

Learn more at **www.cambridgeinternational.org/recognition**

Cambridge Assessment International Education is an education organisation and politically neutral. The content of this syllabus, examination papers and associated materials do not endorse any political view. We endeavour to treat all aspects of the exam process neutrally.

'The depth of knowledge displayed by the best A Level students makes them prime targets for America's Ivy League universities'

Yale University, USA

Supporting teachers

We provide a wide range of practical resources, detailed guidance, and innovative training and professional development so that you can give your students the best possible preparation for Cambridge International AS & A Level.

Teaching resources

- School Support Hub
  www.cambridgeinternational.org/support
- Syllabuses
- Schemes of work
- Learner guides
- Discussion forums
- Endorsed resources

Exam preparation resources

- Question papers
- Mark schemes
- Example candidate responses to understand what examiners are looking for at key grades
- Examiner reports to improve future teaching

Support for Cambridge International AS & A Level

Training

- Introductory – face-to-face or online
- Extension – face-to-face or online
- Enrichment – face-to-face or online
- Coursework – online
- Cambridge Professional Development Qualifications

Find out more at
www.cambridgeinternational.org/profdev

Community

You can find useful information, as well as share your ideas and experiences with other teachers, on our social media channels and community forums.

Find out more at
www.cambridgeinternational.org/social-media

In addition, a pseudocode guide supports Cambridge International AS & A Level Information Technology (9626) to ensure that teachers and learners are familiar with the style used in examinations. This can be found at **www.cambridgeinternational.org/support**

'Cambridge International AS & A Levels prepare students well for university because they've learnt to go into a subject in considerable depth. There's that ability to really understand the depth and richness and the detail of a subject. It's a wonderful preparation for what they are going to face at university.'

US Higher Education Advisory Council

2 Syllabus overview

Aims

The aims describe the purposes of a course based on this syllabus.

The aims are to enable students to:

- develop a broad range of IT skills
- develop an understanding of the parts, use and applications of IT systems within a range of organisations, including the use of networking technology
- develop an understanding of how IT systems affect society in general
- develop a broad knowledge of the use of IT in workplace situations and the potential risks
- develop an understanding of the system life cycle and apply this understanding to workplace situations
- develop an understanding of project management skills
- be aware of new and emerging technologies
- apply their knowledge and understanding of IT to solve problems.

Content overview

Candidates for Cambridge International AS Information Technology study the following topics 1–11.

1   Data processing and information
2   Hardware and software
3   Monitoring and control
4   Algorithms and flow charts
5   eSecurity
6   The digital divide
7   Expert systems
8   Spreadsheets
9   Modelling
10 Database and file concepts
11 Sound and video editing

Candidates for Cambridge International A Level Information Technology study topics 1–11 and the following topics 12–20.

12 IT in society
13 New and emerging technologies
14 Communications technology
15 Project management
16 System life cycle
17 Mail merge
18 Graphics creation
19 Animation
20 Programming for the web

Cambridge International does **not** specify hardware requirements or suppliers for the different software applications. Teachers may choose which software to use for practical tasks. The software used must fully support the practical requirements of the syllabus. This should include the use of file conversion software to ensure files are saved in the required formats.

Support for Cambridge International AS & A Level Information Technology

The School Support Hub is our secure online site for Cambridge teachers where you can find the resources you need to deliver our programmes, including schemes of work, past papers, mark schemes and examiner reports. You can also keep up to date with your subject and the global Cambridge community through our online discussion forums.

www.cambridgeinternational.org/support

Assessment overview

Paper 1

Theory   1 hour 45 minutes

70 marks

Questions are based on sections 1–11 of the subject content. Candidates answer all questions on the paper.

Externally assessed

50% of the AS Level

25% of the A Level

Paper 3

Advanced Theory   1 hour 45 minutes

70 marks

Questions are based on sections 12–20 of the subject content. Sections 1–11 are assumed knowledge and understanding. Candidates answer all questions on the paper.

Externally assessed

25% of the A Level

Paper 2

Practical   2 hours 30 minutes

90 marks

The tasks in this practical paper test sections 8–11 of the subject content. Candidates apply knowledge and understanding from sections 1–7 of the subject content. All tasks are compulsory.

Candidates select the most appropriate software and must use the most efficient methods to solve each task.

Externally assessed

50% of the AS Level

25% of the A Level

Paper 4

Advanced Practical   2 hours 30 minutes

90 marks

The tasks in this practical paper test sections 17–20 of the subject content. The paper includes tasks from sections 8–10 within a problem-solving context. Candidates apply knowledge and understanding of all subject content. All tasks are compulsory.

Candidates select the most appropriate software and must use the most efficient methods to solve each task.

Externally assessed

25% of the A Level

Information on availability is in the **Before you start** section.

There are three routes for Cambridge International AS & A Level Informaton Technology:

	Route	Paper 1	Paper 2	Paper 3	Paper 4
1	**AS Level only** (Candidates take all AS components in the same exam series)	✓	✓		
2	**A Level** (staged over two years) Year 1 AS Level*	✓	✓		
	Year 2 Complete the A Level			✓	✓
3	**A Level** (Candidates take all components in the same exam series)	✓	✓	✓	✓

* Candidates carry forward their AS Level result subject to the rules and time limits described in the *Cambridge Handbook*.

Candidates following an AS Level route will be eligible for grades a–e. Candidates following an A Level route are eligible for grades A*–E.

Assessment objectives

The assessment objectives (AOs) are:

AO1
Recall, select and communicate knowledge and understanding of IT.

AO2
Apply knowledge, understanding, skills and judgement to produce IT-based solutions.

AO3
Analyse, evaluate, and present reasoned conclusions.

Weighting for assessment objectives

The approximate weightings allocated to each of the assessment objectives (AOs) are summarised below.

Assessment objectives as a percentage of each qualification

Assessment objective	Weighting in AS Level %	Weighting in A Level %
AO1 Recall, select and communicate knowledge and understanding of IT	40	35
AO2 Apply knowledge, understanding, skills and judgement to produce IT-based solutions	50	50
AO3 Analyse, evaluate, and present reasoned conclusions	10	15
Total	100	100

Assessment objectives as a percentage of each component

Assessment objective	Weighting in components %			
	Paper 1	Paper 2	Paper 3	Paper 4
AO1 Recall, select and communicate knowledge and understanding of IT	75	0	70	0
AO2 Apply knowledge, understanding, skills and judgement to produce IT-based solutions	0	100	0	100
AO3 Analyse, evaluate, and present reasoned conclusions	25	0	30	0
Total	100	100	100	100

3 Subject content

AS & A Level topics

> **Annual technical updates**
>
> Technical updates will be published each year to take account of emerging technologies relevant to the syllabus content. Please refer to the updates page for this syllabus on the Cambridge International website **www.cambridgeinternational.org/alevel**

Candidates for Cambridge International AS Level Information Technology study topics 1–11.

Candidates for Cambridge International A Level Information Technology study all topics.

The content of the AS Level topics 1–11 is assumed knowledge for the A Level components.

The following information identifies content which must be covered within all topics. Where the term 'including' is used, everything listed must be studied. However, this list is not exhaustive and other related aspects should also be studied.

Note that no marks are awarded for brand names in candidate responses.

This syllabus gives you the flexibility to design a course that will interest, challenge and engage your learners. Where appropriate you are responsible for selecting suitable subject contexts, resources and examples to support your learners' study. These should be appropriate for the learners' age, cultural background and learning context as well as complying with your school policies and local legal requirements.

1 Data processing and information

Candidates should know and understand:

1.1 Data and information	
Data and information	Differences between data and information
	Identifying that data has no meaning and that it becomes information through context and meaning
Direct and indirect data	
• Uses	Including suitability for a given purpose
• Sources	Sources of direct data including questionnaires, interviews, data logging
	Sources of indirect data including Electoral Register, businesses collecting personal information when used by third parties
• Advantages and disadvantages of direct and indirect data	

1.2 Quality of information	
• Factors that affect the quality of information	Including: accuracy, relevance, age, level of detail and completeness of the information

1 Data processing and information (continued)

Candidates should know and understand:

1.3	Encryption	
•	The need for encryption	
•	Methods of encryption	Methods including: symmetric (using private key only), asymmetric (using private and public keys)
•	Encryption protocols	Protocols including: the purpose of Secure Socket Layer (SSL)/ Transport Layer Security (TLS) and the use of SSL/TLS in client-server communication
•	Uses of encryption	Uses including: protection of data such as on a hard disk, email or in HTTPS websites
•	Advantages and disadvantages of different protocols and methods of encryption	

1.4	Checking the accuracy of data	
Validation and verification		
•	Methods	Validation including: presence check, range check, type check, length check, format check, check digit, lookup check, consistency check, limit check
•	Uses	Verification including: visual checking and double data entry, parity check, checksum, hash total, control total
•	The need for both validation and verification	Candidates should understand the difference between validation and verification

1.5	Data processing	
•	Methods (batch, online, real-time)	Batch processing
		Including: master and transaction files and their use in payroll and customer orders
		Including the steps involved in updating a master file using a transaction file
		Online processing
		Including the steps involved in carrying out: electronic funds transfer, automatic stock control, electronic data exchange, business-to-business buying and selling, online stores
		Real-time
		Including systems where the output affects the input e.g. central heating/air conditioning systems, guidance systems (for rockets, etc.)
•	Uses	
•	Write an algorithm	
•	Advantages and disadvantages of different methods of processing	

2 Hardware and software

Candidates should know and understand:

2.1	Mainframe computers and supercomputers	
•	Characteristics	Characteristics including: longevity, RAS, security, performance metrics (MIPS and FLOPS), volume of input, output and throughput, fault tolerance, operating system, type of processor, heat maintenance
•	Uses	Mainframe computer uses including: census, transaction processing, industry statistics, consumer statistics
		Supercomputer uses including: quantum mechanics, weather forecasting climate research
•	Advantages and disadvantages of mainframe and supercomputers	

2.2	System software	
•	Types	Types including: compilers, interpreters, linkers, device drivers, operating systems and utilities
•	Uses	Candidates will be expected to explain how high level language is translated to run on different computer systems
•	Advantages and disadvantages	

2.3	Utility software	
•	The need for utility software	Including: anti-virus, back-up, data compression, disk defragmentation (including understanding the structure of hard disk storage), formatting, file-copying, deleting
•	Types	
•	Uses	
•	Advantages and disadvantages	

2.4	Custom written software and off-the-shelf software	
•	Uses	
•	Advantages and disadvantages	Including: degree of testing, level of support, cost, adaptability
		Candidates should also understand the concept of proprietary and open source software (see also 10.5)

2.5	User interfaces	
•	Types	Including: command line interface, graphical user interface, dialogue interface, gesture based interface
•	Uses	
•	Advantages and disadvantages	

3   Monitoring and control

Candidates should know and understand:

3.1 Monitoring technologies	
• Sensors	Examples of sensors including: light/UV, temperature, pressure, humidity, sound, infrared, touch sensors, electromagnetic field sensors and proximity sensors
• Uses	Including uses:
	Weather stations use temperature sensors to measure ambient temperature, pressure sensors to measure atmospheric pressure, humidity sensors to measure absolute and relative humidity, light sensors to measure sunlight
	Examples of other uses including: monitoring water pollution, weather stations, environmental monitoring
• Calibration	The importance of calibration
	The various methods used to calibrate devices, including when to use one point calibration, two point calibration and multi-point calibration, knowing methods of calibrating readings from sensors such as temperature sensors
• Advantages and disadvantages	

3   Monitoring and control (continued)

Candidates should know and understand:

3.2	Control technologies

- Sensors
- Actuators
- Uses
- Write an algorithm
- Draw a flowchart
- Advantages and disadvantages of different control technologies

Use of sensors including:

Touch sensors incorporated within detection devices used to measure fluid levels (cooling water level in nuclear power plants)

Temperature sensors to measure temperature in a glass/greenhouse

Light sensors to measure light level in a glass/greenhouse

Moisture sensors to measure water content of soil

Infrared sensors to detect movement of human bodies, which emit heat, in burglar alarm systems

Electromagnetic field and ultrasonic sensors in car parking systems

Sound sensors in burglar alarm systems to detect the level of sound an intruder might make

Proximity sensor in smartphones to switch off screen display when phone is held near to the ear

Examples of control technology systems include:

Microprocessor controlled –

glass/greenhouses

central heating systems

air conditioning systems

burglar alarms

control of traffic/pedestrian flow

car park barriers

traffic lights

Wireless Sensor and Actuator Networks

smart homes

Write an algorithm or draw a flowchart to represent the processing involved in the control technologies listed above (see 4.1)

4   Algorithms and flowcharts

Candidates should be able to:

4.1 Algorithms and flowcharts	
• Edit a given algorithm	Candidates should be able to write a basic algorithm that demonstrates a decision making process
	Including:
	Conditional branching
	Looping
	Nested loops
	Procedures/subroutines
• Write an algorithm using pseudocode to solve a given problem	To include:
	INPUT/READ
	WRITE/PRINT
	IF…ELSE…ENDIF
	WHILE… ENDWHILE
	REPEAT…UNTIL
	CASE…ENDCASE
	Comparison operators >, <, =
	Arithmetic operators +, -, *, /
• Edit a given flowchart • Draw a flowchart to solve a given problem	Candidates should be able to draw a basic program flowchart that demonstrates a decision making process
	Including: input/output, decision, terminator (start, stop), process boxes, subroutine, connector and flow line. See symbols at the end of the Subject content section
	Including: identifying errors in an algorithm/program flowchart for a given scenario

5   eSecurity

Candidates should know and understand:

5.1	Personal data	
•	What personal data is	Including: Why personal data should be kept confidential
•	Keeping personal data secure	How personal data can be kept confidential, including the removal of geotags from photos/videos
•	Preventing misuse of personal data	How personal data can be gathered by unauthorised persons and how this might be prevented including: smishing, vishing, phishing and pharming Candidates will be expected to evaluate the methods of prevention

5.2	Malware	
•	Types	Types of malware including: Trojan Horse, worms, spyware, adware, rootkit, malicious bots, ransomware and others
•	Uses	Uses including: fraud, industrial espionage, sabotage
•	Consequences for organisations and individuals	
•	Prevention	Prevention including software and physical

6   The digital divide

Candidates should know and understand:

6.1	The digital divide	
•	What the digital divide is	Including: the gap between people and regions that have access to aspects of modern technology and information, and those with restricted or no access
•	Causes and effects of the digital divide	The technology includes telephone, television, personal computers and the internet
•	Reducing the effects of the digital divide	The digital divide can also exist because of availability of high and low performance computers, wireless connections
		Groups affected include:
		people in cities and people in rural areas
		the educated and uneducated
		the old and young
		socioeconomic groups
		more and less industrially developed/technologically aware nations
		Effects of the digital divide include inequality of access to all types of internet services

7   Expert systems

Candidates should know and understand:

7.1 Expert systems	
• How expert systems are used to produce possible solutions for different scenarios	Components including: user interface, inference engine, knowledge base (as a database of facts and rules base), explanation system, knowledge base editor
	Scenarios including: mineral prospecting, investment analysis, financial planning, insurance planning, car engine fault diagnosis, medical diagnosis, route scheduling for delivery vehicles, plant and animal identification
	Candidates are expected to understand the concepts of backward chaining and forward chaining
	Including the terms: data driven and goal driven, their use in diagnoses, gaming and artificial intelligence

8   Spreadsheets

Candidates should be able to:

8.1 Create a spreadsheet	
Create structure	
• Create page/screen structures to meet the requirements of an audience and/ or task specification/house style	Including: page orientation, page size, fit to page, margins, header, footer
• Create/edit spreadsheet structures	Insert, delete, hide, resize, merge, edit spreadsheet structure including: rows, columns, cells
• Protect cells and their content	Including: cells, rows, columns, worksheets and workbooks
• Freeze panes and windows	
Create formulae and use functions	
• Use formulae	Including: add, subtract, multiply, divide, indices
• Use absolute reference, relative reference, named cells, named ranges	Candidates should be able to work with these across several worksheets or workbooks.
• Know and understand why absolute and relative referencing are used	
• Use functions	Including: sum, average, minimum, maximum, integer, rounding, counting, IF, nested IF, lookup (including: vertical, horizontal), date and time functions; extracting numeric values from strings, concatenating cell content, INDEX, MATCH, conditional formulae to include counting, sum, average, nested functions

(continued)

8 Spreadsheets (continued)

Candidates should be able to:

8.1 Create a spreadsheet (continued)

Use validation rules	(See 1.4)
	Use appropriate input and error messages
• Format cells	Including: date, time, text, numeric, currency, percentage, fractions, text orientation, alignment
• Format cell emphasis	Including: size, style, colour, shading, merge, borders, comments, conditional formatting

8.2 Test a spreadsheet

Test a spreadsheet structure	Create and apply a test plan to test functions , validation rules (see 1.4)

8.3 Use a spreadsheet

Extract data	Search using: text, numeric, date, time, Boolean operators (AND, OR, NOT), >, <, =, >=, <=, contains, starts with, ends with
• Sort data	Including: ascending, descending on multiple columns
• Summarise and display data using pivot tables and pivot charts	
• Import and export data	
	Including: csv, txt, pdf, graphs and charts

8.4 Automate operations with a spreadsheet

• Create macros	• Create and record macros to repeat and automate common operations
	• Add controls to customise the user interface

8.5 Graphs and charts

• Create a graph or chart appropriate to a specific purpose	Including: appropriate data series, from contiguous data, from non-contiguous data, specified range(s)
	Including: bar chart, pie chart, line graph, comparative bar chart, comparative line graph, combination chart
• Apply chart formatting	Including: title, legend, segment labels, segment values, percentages, category axis labels, series labels, value axis labels, scales, set axis scale maximum, set axis scale minimum, set data interval, add secondary axis, extract pie chart sector

9   Modelling

Candidates should be able to:

9.1 Modelling and simulations	
Use what-if analysis	Including: what-if analysis, predicting the result of changing data, goal seek
Test a spreadsheet model	Create and apply a test plan to test a spreadsheet model
Know and understand:	Including for: financial forecasting, population growth, climate change, weather systems, queue management, traffic flow, construction
• What-if analysis	
• The characteristics of modelling software	
• The need for computer models	
• The effectiveness of spreadsheet models	
• The use of a model to create and run simulations	Uses including: natural disaster planning, pilot training, learning to drive a car, nuclear science research

10   Database and file concepts

Candidates should be able to:

10.1 Create a database	
Assign a data type and an appropriate field size to a field	Including: text, alphanumeric, numeric (integer, decimal), date, time, Boolean
Know and understand the three relationships: one-to-one, one-to-many and many-to-many	
Create and use relationships	Including: one-to-one and one-to-many
Create and interpret an entity relationship diagram	Including: conceptual, logical and physical entity relationship diagrams
Know and understand:	
The difference between a flat file and a relational database	
Why one might be preferred in certain situations	
Create a relational database	
Know and understand the function of key fields	Including: primary key, compound key, foreign key
Set keys	Including: primary key, compound key, foreign key
Know and understand referential integrity and its importance	
Use referential integrity	
Validate and verify data entry	Use validation rules (see 1.4)
	Test validation applied to a database
	Verify data entry (see 1.4)

<div align="right">(continued)</div>

10 Database and file concepts (continued)

Candidates should be able to:

10.1 Create a database (continued)	
Perform searches	Simple query on single criterion
	Complex queries using multiple criteria
	Queries using static parameters – queries using dynamic parameters
	Nested queries
	Use queries to find, remove duplicate records
	Summarise data (including cross-tab query)
	Using text, numeric, date, time, wildcard, Boolean operators (AND, OR, NOT), >, <, =, >=, <=
Use arithmetic operations, numeric and logical functions to perform calculations within a database	Including calculated controls and calculated fields
Sort data	Including: ascending, descending, grouped
Design and create an appropriate data entry form	Including: appropriate font styles and sizes, spacing between fields, character spacing of individual fields, use of white space, radio buttons, drop down menus, highlighting key fields, use form controls, create linked subforms
Design and create a switchboard/menu within a database	
Import data	Including: csv, txt
Export data	Including: table, query, report, export as csv, txt, rtf

10.2 Normalisation to third normal form (3NF)	
Know and understand the characteristics of data in unnormalised form (UNF), first normal form (1NF), second normal form (2NF) and third normal form (3NF)	
Know and understand the normalisation of data (to include the advantages and disadvantages)	
Normalise a database to first normal form (1NF), second normal form (2NF) and third normal form (3NF)	

10 Database and file concepts (continued)

Candidates should be able to:

10.3 Data dictionary

Know and understand the components of a data dictionary

Create a data dictionary and select appropriate data types for a given set of data and a given situation

Identify different data types	Including: text, alphanumeric, numeric (integer), real, percentage, currency), date, time, Boolean, logical (yes/no, true/false)

10.4 Query selection

Know and understand the use of static and dynamic parameters in a query (see 10.1)

Know and understand when static and dynamic parameters should be used in queries (see 10.1)

Know and understand when simple, complex, nested and summary queries (including cross-tab queries/pivot tables) should be used (see 10.1)

10.5 File and data management

Know and understand:

- Different file types and their use
- What is meant by proprietary and open-source file formats, and why open-source file formats are needed (see also section 2.4)
- Why generic file formats are needed
- The use of indexed sequential access
- The use of direct file access
- The use of a hierarchical database management system
- The features of a management information system (MIS)
- How a MIS can be used by organisations

11   Sound and video editing

Candidates should be able to:

11.1 Sound and video editing	
Edit a video clip to meet the requirements of its intended application and audience	Set an aspect ratio
	Trim a video clip to remove unwanted footage
	Splice/join together video clips
	Create text based slides
	Create credits
	Add captions and subtitles
	Add fading effects
	Add pan and zoom effects
	Add animation effects
	Extract a still image from a video clip
	Resize and crop a still image to match a video's aspect ratio
	Insert a still image
	Add sound to a video clip
	Remove sound from a video clip
	Alter the speed of a video clip
	Use of filters and colour correction
	Export a video clip in different file formats (including: MP4, AVI, MOV, WMV)
	Compress a video to different resolutions to suit different media (including: DVD, internet)
Know and understand the effects of different methods of compression on video	Including how the different compression methods affect video quality
Know and understand why typical features found in video editing software are used	Including:
	trim and crop a video clip
	create text based slides
	create credits
	add captions and subtitles
	add fading effects
	extract a still image from a video clip
	insert a still image
	add sound to a video clip
	export a video clip in different file formats
	compress a video to different resolutions

(continued)

11   Sound and video editing (continued)

11.1 Sound and video editing (continued)	
Edit a sound clip to meet the requirements of its intended application and audience	Import new tracks
	Add a track to an existing sound clip
	Normalise a sound clip including removing any DC offset
	Trim a sound clip to remove unwanted material
	Splice/join together two sound clips
	Fade in and fade out a sound clip
	Alter the speed of a sound clip
	Change the pitch of a sound clip
	Add or adjust reverberation
	Change a sound clip from stereo to mono
	Apply equalisation, high, low pass filters to a sound clip
	Apply echo, delay to a sound clip
	Apply noise reduction to a sound clip
	Overdub a sound clip to include a voice over
	Export a sound clip in different file formats including: MP3, MP4a, WAV, AAC)
	Compress (including: the use of MP3) the sound file to different sample rates to suit different media
Know and understand how and why typical features found in sound editing software are used	Including:
	trim a sound clip
	splice/join together two sound clips
	fade in and fade out a sound clip
	normalise a sound clip
	apply noise reduction to a sound clip
	overdub a sound clip to include a voice over
	export a sound clip in different file formats
	compress (including: the use of MP3) the sound file
Know and understand why file sizes depend on sampling rate and sampling resolution	Including describing sampling rate and sampling resolution
Know and understand the effects of different methods of compression on sound	Including: how the different compression methods affect the audio quality, saving in files v containers, lossy and lossless

A Level topics

12   IT in society

Candidates should know and understand:

12.1 Digital currencies	
• Types	Including:
• Characteristics	Digital/electronic currency, virtual currency, cryptocurrency, central bank digital base money, stored value cards
• Advantages and disadvantages	
• Uses	
	Centralised systems (debit, credit cards, electronic point of sale), decentralised systems (e.g. Bitcoin, Litecoin, peer-to-peer electronic monetary systems), mobile electronic wallets
• Impact and risks of digital currencies	Impact upon/risks for individuals, businesses, governments, global economy

12.2 Data mining	
• Process of data mining	Process including:
	1 Business understanding
	2 Data understanding
	3 Data preparation
	4 Data modelling
	5 Evaluation
	6 Deployment
• Uses	Uses including: how and why data mining is used in national security, surveillance, businesses, scientific research, health care, and the analysis of social and economic trends
• Advantages and disadvantages	Including ethical and privacy concerns

12   IT in society (continued)

Candidates should know and understand:

12.3 Social networking services/platforms	
• Types	Types including:
	Chat rooms, instant messaging, forums, email, blogs, microblogs, social media
• Uses	Uses including:
	• use by individuals, businesses, organisations, governments
	• use in, e.g. education, finance, health care, for creating and sharing information, news sources
• The impact of social networking	Including impact on:
	• individuals (e.g. intellectual isolation, physical and mental health of different age groups, ideological polarisation, stereotyping, cognitive issues)
	• businesses (e.g. advertising), organisations (e.g. use by police to disseminate information, weather warnings)
	• governments (e.g. distribution of information, censorship), false/distorted information
• Advantages and disadvantages of different types of social networking	

12.4 The impact of IT	
• On society	Including on:
	• sport, manufacturing, health care, education, banking, e-business and finance, news and media, family and home, entertainment and news, government, politics
• On monitoring and surveillance in society	• including policing

12.5 Technology enhanced learning	
• Methods of delivery	Including:
	computer-based training
	online tutorials
	networked courses
	Massive Open Online Courses (MOOC)
	video-conferencing
• Impact	Including impact of different delivery methods on student achievement, learner autonomy, student and teacher motivation
• Advantages and disadvantages of different methods of delivery	

13   New and emerging technologies

Candidates should know and understand:

13.1   New and emerging technologies

- Types

  Including:

  NFC (Near Field Communication)

  ultra-high definition television systems

  artificial intelligence

  augmented reality

  virtual reality

  robotics

  computer-assisted translation

  holographic imaging

  holographic and 4th generation optical data storage

  3D printing

  vision enhancement

  wearable computing

- Impact of new and emerging technologies

  Including on:

  individuals and their lifestyles

  organisations

  medicine and health care (including: development of prosthetics and medical products, tissue engineering, artificial blood vessels, the design of medical tools and equipment)

  scientific research

  the environment (including: e-waste, recycling, power consumption, manufacturing processes)

14   Communications technology

Candidates should know and understand:

14.1   Networks

• Types	Including: local area network (LAN), wide area network (WAN), client-server, peer-to-peer, Virtual Private Network (VPN), mobile networks
• Characteristics and uses of each type	Characteristics including: protocols associated with each type of network such as those used to increase privacy and security (e.g. tunneling, transport layer security (SSL/TLS), Internet Protocol Security), BitTorrent for transferring large files
	Uses including:
	sharing and storage of resources
	sharing of peripherals
	exchange of data
	access to internet services
	access to telephony services
	access to content delivery services such as those used for, e.g. video-streaming and software downloads
• Advantages and disadvantages of each type	

14.2   Components in a network

• The role of components in a network	The role of components including:
	network interface cards and wireless network interface cards
	repeaters, hubs, and switches
	wireless access points, gateways, bridges and routers
	firewalls (hardware and software)
• The operations of networking components	Including:
	how each component carries out its role
	how each component works with the others in a network

14.3   Network servers

• Types of network server	Including: file server, web server, mail server, applications server, print server, FTP server, proxy server, virtual server
• The role of servers in a network	Including: the function of servers in a network
• The operations of servers in a network	Including:
	the 'request and response' method of communication between servers and clients
	within server farms
• Advantages and disadvantages of each type of server for a given scenario	

14 Communications technology (continued)

Candidates should know and understand:

14.4 Cloud computing

• Characteristics of cloud computing	Including: the key characteristics of cloud computing for sharing computing resources
• Uses of cloud computing	Including: by individuals and organisations
• Advantages and disadvantages of cloud computing for a given scenario	

14.5 Data transmission across networks

• Speed of transmission: bandwidth, bit rate	Including: how bandwidth is defined the bandwidths made available by: different transmission media, different internet access technologies, e.g. ethernet, fibre optic, wireless, mobile communications how bit rates are quantified and measured
• Data streaming	Including: real time and on demand media streams the impact of bit rate and bandwidth on the streaming of audio and video data

14.6 Routing data in networks

• Methods of sending data over a network:	
– packet switching	Including: the structure of packets (to include what is contained in the packets) The modes of connection (to include how and why they are used). Including: connection mode e.g. Frame Relay, Transmission Control Protocol (TCP), connectionless (datagram) mode, e.g. Ethernet, Internet Protocol (IP), User Datagram Protocol (UDP)
– circuit switching	Including: the use of communication channels in circuit switching
– message switching	Including: the store and forward method of sending messages across networks
• The purpose and use of network addressing systems	Including: Media Access Control (MAC) addressing, IP addressing (IP4 and IP6)

14   Communications technology (continued)

Candidates should know and understand:

14.7   Network protocols

• The definition of a protocol	Including: explaining the term 'protocol' as used in networking and why protocols are necessary
• The purposes and uses of protocols in the preparation, addressing, sending and receiving of data across networks including the internet	Protocols including:

Protocols including:

Transmission Control Protocol (TCP)

Internet Protocol (IP)

Internet Control Message Protocol (ICMP)

Address Resolution Protocol (ARP) and Inverse Address Resolution Protocol (InARP)

Dynamic Host Configuration Protocol (DHCP)

User Datagram protocol (UDP)

Hypertext Transfer Protocols (HTTP and HTTPS)

File Transfer Protocol (FTP)

Tunneling protocol, e.g. L2TP

Simple Mail Transfer Protocol (SMTP)

Post Office Protocols (e.g. POP3)

Internet Message Access Protocol (IMAP)

Telnet

SSH

TLS/SSL

14.8   The management of network traffic

• Static and dynamic routing	Including: the selection of paths for network traffic and the use of routing tables
• Function of routing protocols	Including: interior gateway protocols, exterior gateway protocols, border gateway protocols
• Use of protocol layering	Including: TCP/IP and Open Systems Interconnection model (OSI model), the function of each layer in the TCP/IP suite, the function of each layer in the OSI model, comparison of the schemes

14.9   Data transmission methods

• The properties, features and characteristics of different transmission methods	Including: fibre optic, copper cables (coaxial and twisted pair), using lasers
• Typical applications of each method	
• Advantages and disadvantages of each method	Including: the effect of the medium on available bandwidth for data transmission

14   Communications technology (continued)

Candidates should know and understand:

14.10   Wireless technology

• Methods of wireless transmission of data	Including: Wi-fi, Bluetooth, infrared, microwave and radio
• Uses and operation of wireless transmission methods	Including: security issues associated with wireless transmission and wireless security protocols such as WEP, WPA and their variants
• Advantages and disadvantages of wireless transmission methods	Including the benefits and limitations of each method of wireless transmission

14.11   Mobile communication systems

• Cellular networks	Including: structure of a cellular network use of 3G, 4G, 5G systems for mobile communications
• How satellite communication systems are used for transferring data	Including: in global positioning systems (GPS), in global mapping systems, in surveillance, in telecommunications (e.g. television and radio broadcasting, telephones) how communications data is prepared, sent and received by satellite communication systems

14.12   Network security

• Networking security threats to stored data and files	Including: botnets that attack systems, malware with actions that harm computer users, data, files and systems
• Impact of network security threats on individuals and organisations	Including: data destruction, manipulation and modification and theft by unauthorised users, identity theft
• Prevention of network security issues using physical and software methods	Including: How physical methods can prevent unauthorised access, Including: use of barriers, locks, surveillance, alarm systems, security guards How software methods can prevent unauthorised access, Including: biometric methods, anti-malware, anti-virus and anti-spyware software for protecting data, files and systems encryption, access rights/permissions for protecting data and files how (hardware and software) firewalls can be configured to control access to networks
• Advantages and disadvantages of the various methods	For preventing unauthorised access to computer data, files and systems

14 Communications technology (continued)

Candidates should know and understand:

14.13 Disaster recovery management

• Identification of threats and risks	Including: risk analysis, perpetrator analysis, risk testing, quantifying the risk
• Control of threats	Including:
	how to detect threats and prevent disaster
	how to restore after a disaster
• Strategies to minimise risks	Including:
	use of protection for power supplies
	use of password and access controls for data and file protection
	protection of data and software from malware, unauthorised access
	use of backup strategies

15 Project management

Candidates should know and understand:

15.1 The stages of the project life cycle

• Project initiation	Including: identifying objectives, scoping project, stakeholders, resources required and high-level schedules
• Project planning	Including detailed planning of resources and scheduling of tasks
• Project execution and monitoring	Including: implementing the plan; monitoring progress against time, cost and quality, reporting to stakeholders
• Project close	Including: project completion and review
	Candidates should understand each stage has a phase review and why the reviews are conducted

15.2 Project management software

• Uses for supporting projects	Including supporting planning, scheduling of tasks, allocation of resources, costings, communication, and collaborative working and decisions
• Strengths and weaknesses of project management software for supporting projects	

15   Project management (continued)

Candidates should know and understand:

15.3	Tools and techniques for project management tasks

- Gantt charts

Including:

creating a Gantt chart

using and interpreting Gantt charts

- Performance Evaluation and Review Technique (PERT) and Critical Path Method (CPM)

Including:

creating PERT charts

using and interpreting PERT charts for the analysis and management of projects

components such as activities/tasks/work breakdown structures (WBS), timings, float, end points, milestones, dependencies, deliverables

critical path calculations and determinations to determine the longest path of dependent activities

the use of critical path analysis for, e.g. work flow control such as authorising work, costings, allocating resources

16   System life cycle

Candidates should know and understand:

16.1	The stages in the system life cycle

Candidates should be able to explain the relationship between the different stages of the system life cycle.

16.2	Analysis

- Methods of researching for a given a situation

Including: questionnaires, interviews, observation, document analysis

- Content and purpose of specifications

Including: user requirements specification, system specification, design specification

16.3	Design

- System processing
- Flow of data through system

Candidates will be expected to construct a system flowchart and a data flow diagram (DFD) using correct symbols. See symbols at the end of the Subject content section.

- Data storage

Including: databases, files (input and output)

- Input forms

Including: features and elements of forms, appropriate use of forms for data collection, validation and checking of data collected by forms, input screen layouts

- Output reports

Including: output screen layouts, printed copy layouts

16   System life cycle (continued)

Candidates should know and understand:

16.4 Development and testing	
• Test plans	Including: the need for testing and the purpose of a test plan, contents of a test plan
• Test data	Including: the types and purpose of test data
• Alpha and beta testing	Including: differences between alpha and beta testing
• White box and black box testing	Including: differences between white box and black box testing
	Candidates are expected to be able to create a test plan for a given situation.

16.5 Implementation	
• Methods of implementing a system	Including: parallel running, direct changeover, phased implementation, pilot implementation
• Advantages and disadvantages of each implementation method for a given situation	Including: how each method is implemented in a given situation, the suitability of an implementation method for a given situation

16.6 Documentation	
• Types of documentation and why each is needed	Including: user and technical documentation
• Contents of the documentation	

16.7 Evaluation	
• Methods of evaluating a new system	Including: in terms of efficiency, ease of use and meeting user requirements

16.8 Maintenance	
• Types of maintenance and why each is needed	Including: perfective, adaptive, preventive, corrective maintenance
• How each type of maintenance is carried out	

16.9 Prototyping	
• Types of prototyping and why each is needed	Including: evolutionary, incremental, throw-away, rapid
• Advantages and disadvantages of each type of prototyping	

16   System life cycle (continued)

Candidates should know and understand:

16.10 Methods of software development	
• Stages/processes of each method • Advantages and disadvantages of each method	Including: Agile, Iterative, Incremental, Rapid Application Development (RAD), 'Waterfall' methods

17   Mail merge

Candidates should be able to:

17.1 Mail merge	
Use/create/edit a source data using appropriate software	
Create a master document structure	Including: standard letter, labels
Link a master document to a source file	Including: identifying and using correct field names, using conditional operators, embedding a chart/table, update links
Specify rules	
• for selecting recipients	Including: edit/sort/filter the mail merge recipient list, SKIPIF
• for managing document content	Including conditional fields, IF THEN ELSE
Set up fields	
• for manual completion	Including: create appropriate prompts to the user for manual completion, FILL IN, ASK
• for automatic completion	Including: date field, time, document properties
• calculated fields	Using arithmetic operators
Use manual methods and software tools to ensure error-free accuracy	Including proof reading

Perform mail merge	Including:
	    using the master document and data sources
	    control record selection and omission when merging

18   Graphics creation

Candidates should be able to:

18.1 Common graphics skills	
• Work with layers	Including: raise, lower, bring to front, order layers
• Use transform tools	Including: resize, skew, flip, rotate, move, scale, shear
• Use grouping or merging tools	Including: group, ungroup, flatten
• Use alignment and distribution tools	Including: left, right, top and bottom alignment and vertical and horizontal distribution.
• Use layout tools	Including: rulers, grids, guidelines, snapping
• Use colour picker tools	Candidates should be able to select a colour within an image or from other sources
• Use crop tools	
Know and understand the properties of different colour systems	(RGB, HSL, CMYK, CMS)
Know and understand the need for different image resolutions	Including the impact of having too low/high a resolution of an image on screen or in print
Know, understand and select different bitmap and vector file formats	Including their suitability for use in a given scenario
Export an image in different file formats	Including: svg, bmp, jpg, png, gif, tif, pdf
Change the opacity of all or part of an image	

18.2 Vector graphics	
Create a vector graphic that meets the requirements of its intended application and audience	
• Use vector drawing tools	Including: freehand drawing, Bezier curves and straight lines
	Shape tools – creation of rectangles, ellipses, circles, arcs, stars, polygons and spirals
• Use selection tools to select parts of a vector graphic	
• Use fill tools to colour elements	Including gradient fills
• Use node and path editing	Including adding and moving nodes
	Deleting nodes to simplify paths
	Using Bezier handles
	Align and distribute nodes
• Convert bitmap images into editable vector shapes	Including trace bitmaps
	Candidates should know and understand the advantages and disadvantages of converting a bitmap image into an editable vector shape

18   Graphics creation (continued)

Candidates should be able to:

18.3	Bitmap images	
Create a bitmap image that meets the requirements of its intended application and audience		
•	Use selection tools to select parts of a bitmap image	Including lasso, magic wand and colour select tools
•	Adjust colour levels	Including brightness, contrast and colour balance, shadows, highlights, convert to greyscale
•	Use tools/filters to alter parts of an image	Including distort, clone, blur, sharpen and red eye removal
•	Resize an image/canvas	Including: lossy and lossless compression, changing colour depth, changing resolution

18.4	Compression	
•	Know and understand the effects of different methods of compression on images	

18.5	Text	
•	Select font style	Including: font face, size, kerning, letters spacing and line spacing
•	Fit text to path or shape	Aligning text along a line or around a shape
•	Set text in a shape	
•	Convert text to curves	Convert fonts into editable vector shapes

19   Animation

Candidates should be able to:

19.1	Animation

Create an animation (stop motion and key frame) that meets the requirements of its intended application and audience

- Configure the stage/frame/canvas for an animation

  Including:

  setting colour, size and the aspect ratio

  using rulers, guides, and grid settings

  setting snapping options

- Import and create Vector objects

  Including tracing bitmaps and adding text

- Control object properties

  Such as:

  stroke and fill settings

  size position and orientation

  transparency

- Use Inbetweening ('Tweening') tools

  To:

  show motion

  show shape, size and colour changes

- Set paths
- Use layers
- Apply masks

Control animations

By:

adjusting frame rates

looping or stopping animations

Candidates should know and understand:

- The basic principles of animation

  Including:

  Frames, key frames and property key frames

  Timings

  Coordinates

  Inbetweening and what effect it creates

  Morphing and what effect it creates

- Different animation types and methods

  Including: cell animation, stop motion, time lapse, flip book, CGI, 2D, 3D

- The use of animation variables when creating animations

  Including:

  the primary, e.g. graphical elements, and secondary, e.g. sound, components of animation

  the use of animation variables to control the position of an animated object or parts of an animated object

20   Programming for the web

It is recommended that for this section of the syllabus, candidates should have a working knowledge of html and css, (for example, have studied website authoring in Cambridge IGCSE Information and Communication Technology, syllabus 0417).

Candidates must be able to:

20.1 Programming for the web	

Use JavaScript to

• Add interactivity to web pages	Including by:
	inserting JavaScript in HTML
	creating and using external scripts
• Change HTML content	Including:
	text/number, including calculations and string manipulation
	images
• Change HTML styles	Change style of HTML elements using
	document.getElementById(id).style.property = new style
• Show/Hide HTML elements	Using
	document.getElementById(id).style.visibility=
	document.getElementById(id).style.display=
• Display data in different ways	Including by:
	writing into an HTML element, using innerHTML
	writing into the HTML output using document.write()
	writing into an alert box, using window.alert()
	writing into the browser console, using console.log()
• React to common HTML Events	Including: onload, onchange, onclick, onmouseover, onmouseout, onkeydown
• Provide user interaction	Using confirm() and prompt() popups

Candidates must be able to use correct syntax to:

• Create statements	Composed of:
	values (literals and variables)
	operators (assignment, arithmetic, algebraic, string, comparison, logical, conditional, type)
	expressions
	keywords
	comments
• Use JavaScript loops for iterative methods	Including
	for loop
	for/in loop
	while loop
	do/while loop

(continued)

20   Programming for the web (continued)

Candidates must be able to use correct syntax to:

•	Create functions	To be executed:
		when an event occurs
		when invoked from code
		automatically (self-invoked)
•	Use JavaScript timing events	Execution interval methods:
		setTimeout()
		setInterval()
•	Add comments to annotate and explain code	Including: single line and multi-line

Candidates should know and understand:

|		
•	The structure and syntax of JavaScript code	Including:
•	A range of object-based JavaScript programming techniques and terms	JavaScript statements
		(composed of values, operators, expressions, keywords and comments)
		Data types
		(including: number, string, Boolean, array, object)
		Type conversions
		Variables and arrays
		JavaScript operators
		(including: arithmetic, assignment, string)
		Comparison operators
		(equal to, equal value and equal type, not equal to, not equal value and not equal type, greater than, less than, greater than or equal to, less than or equal to)
		Logical operators
		(AND, OR, NOT)
		Conditional operators
		(if, else, else if, switch)
		Ternary operator
		Loops
		(for, for/in, while, do/while)
		Break
		Interaction: alert(), prompt(), confirm()
		Functions
		Execution interval methods: setTimeout(), setInterval()

Candidates should be able to describe and explain the terms and programming techniques described above

Flowchart, system flowchart and data flow diagram symbols

Flowchart symbols

Element	Symbol
Input/output	
Decision	
Terminator (Start/Stop)	
Process box	
Subroutine	
Connector	A
Flow line	
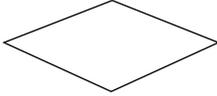
System flowchart symbols

Element	Symbol
Input/output	
Process	
Single document output	
Multiple document output	
Magnetic disk file	
Magnetic tape file	
Interaction input symbol	
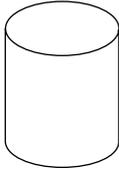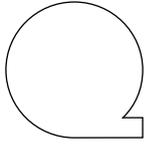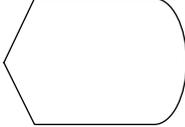
Data flow diagram symbols

Element	Symbol
Process	
Data store	
Data source or destination (inputs and outputs)	
Duplication data source or destination	
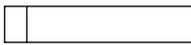
4 Details of the assessment

Calculators

Calculators are **not** allowed in Paper 1 or Paper 3.

Paper 1 Theory

Written paper, 1 hour 45 minutes, 70 marks

This is a compulsory written paper which tests sections 1–11 of the syllabus content. The paper consists of short-answer and structured questions of variable mark value. Candidates must answer all questions. Candidates answer on the question paper.

Paper 2 Practical

Practical paper, 2 hours 30 minutes, 90 marks

This is a compulsory practical paper which tests sections 8–11 of the syllabus content. Candidates perform practical tasks within a structured problem-solving context and submit their work electronically. They will also need to apply their knowledge from sections 1–7 of the syllabus content. Candidates must answer all questions. Candidates must **not** have access to the internet or email.

Candidates work with electronic resource files provided by Cambridge International. These files must be loaded onto the candidate's computer system before the start of the exam.

Candidates must save their work in the format specified in the tasks. If work is saved in an incorrect file format, candidates will not receive marks for that task. To ensure candidates are able to convert/export files in any format during the practical tests, file conversion software must be available to candidates on their computers. They should have experience of using this software during the teaching of the syllabus.

Details of how to administer the practical paper can be found in the *Cambridge Handbook*, which is available from the Exams Officer section of our website: **www.cambridgeinternational.org/examsofficers**

Paper 3 Advanced Theory

Written paper, 1 hour 45 minutes, 70 marks

This is a compulsory written paper which tests sections 12–20 of the syllabus content. The content of sections 1–11 is assumed knowledge. The paper consists of a variable number of short answer and structured questions of variable mark value. Candidates must answer all questions. Candidates answer on the question paper.

Paper 4 Advanced Practical

Practical paper, 2 hours 30 minutes, 90 marks

This is a compulsory practical paper which tests sections 17–20 of the syllabus content. The exam also includes practical tasks from sections 8–10 within a problem-solving context. Candidates perform practical tasks and submit their work electronically. Candidates apply their knowledge from all sections of the syllabus. Candidates must answer all questions. Candidates must **not** have access to the internet or email.

Candidates will work with electronic resource files provided by Cambridge International. These files must be loaded onto the candidate's computer system before the start of the examination.

Candidates must save their work in the format specified in the tasks. If work is saved in an incorrect file format, candidates will not receive marks for that task. To ensure candidates are able to convert/export files in any format during the practical tests, file conversion software must be available to candidates on their computers. They should have experience of using this software during the teaching of the syllabus.

Details of how to administer the practical paper can be found in the *Cambridge Handbook*, which is available from the Exams Officer section of our website: **www.cambridgeinternational.org/examsofficers**

Command words

Command words and their meanings help candidates know what is expected from them in the exam. The table below includes command words used in the assessment for this syllabus. The use of the command word will relate to the subject context.

Command word	What it means
Analyse	examine in detail to show meaning, identify elements and the relationship between them
Compare	identify/comment on similarities and/or differences
Contrast	identify/comment on differences
Define	give precise meaning
Describe	state the points of a topic / give characteristics and main features
Discuss	write about issue(s) or topic(s) in depth in a structured way
Evaluate	judge or calculate the quality, importance, amount, or value of something
Examine	investigate closely, in detail
Explain	set out purposes or reasons / make the relationships between things evident / provide why and/or how and support with relevant evidence
Identify	name/select/recognise
Justify	support a case with evidence/argument
State	express in clear terms
Suggest	apply knowledge and understanding to situations where there are a range of valid responses in order to make proposals

5 What else you need to know

This section is an overview of other information you need to know about this syllabus. It will help to share the administrative information with your exams officer so they know when you will need their support. Find more information about our administrative processes at **www.cambridgeinternational.org/eoguide**

Before you start

Previous study

We recommend that learners starting this course should have completed a course in Information and Communication Technology equivalent to Cambridge IGCSE™. The topics covered by Cambridge IGCSE Information and Communication Technology (0417) are assumed knowledge for this syllabus.

Guided learning hours

We design Cambridge International AS & A Level syllabuses based on learners having about 180 guided learning hours for each Cambridge International AS Level and about 360 guided learning hours for a Cambridge International A Level. The number of hours a learner needs to achieve the qualification may vary according to local practice and their previous experience of the subject.

Availability and timetables

All Cambridge schools are allocated to one of six administrative zones. Each zone has a specific timetable.

You can view the timetable for your administrative zone at **www.cambridgeinternational.org/timetables**

You can enter candidates in the June and November exam series. If your school is in India, you can also enter your candidates in the March exam series.

Check you are using the syllabus for the year the candidate is taking the exam.

Private candidates can enter for this syllabus. For more information, please refer to the *Cambridge Guide to Making Entries*.

Combining with other syllabuses

Candidates can take this syllabus alongside other Cambridge International syllabuses in a single exam series. The only exceptions are:

- Cambridge International Computer Science (9618)
- syllabuses with the same title at the same level.

Group awards: Cambridge AICE

Cambridge AICE (Advanced International Certificate of Education) is a group award for Cambridge International AS & A Level. It allows schools to offer a broad and balanced curriculum by recognising the achievements of learners who pass examinations in a range of different subjects.

Learn more about Cambridge AICE at **www.cambridgeinternational.org/aice**

Making entries

Exams officers are responsible for submitting entries to Cambridge International. We encourage them to work closely with you to make sure they enter the right number of candidates for the right combination of syllabus components. Entry option codes and instructions for submitting entries are in the *Cambridge Guide to Making Entries*. Your exams officer has a copy of this guide.

Exam administration

To keep our exams secure, we produce question papers for different areas of the world, known as administrative zones. We allocate all Cambridge schools to one administrative zone determined by their location. Each zone has a specific timetable. Some of our syllabuses offer candidates different assessment options. An entry option code is used to identify the components the candidate will take relevant to the administrative zone and the available assessment options.

Support for exams officers

We know how important exams officers are to the successful running of exams. We provide them with the support they need to make your entries on time. Your exams officer will find this support, and guidance for all other phases of the Cambridge Exams Cycle, at **www.cambridgeinternational.org/eoguide**

Retakes

Candidates can retake Cambridge International AS Level and Cambridge International A Level as many times as they want to. To confirm what entry options are available for this syllabus, refer to the *Cambridge Guide to Making Entries* for the relevant series.

Candidates can carry forward the result of their Cambridge International AS Level assessment from one series to complete the Cambridge International A Level in a following series, subject to the rules and time limits described in the *Cambridge Handbook*.

Equality and inclusion

We have taken great care to avoid bias of any kind in the preparation of this syllabus and related assessment materials. In compliance with the UK Equality Act (2010) we have designed this qualification to avoid any direct and indirect discrimination.

The standard assessment arrangements may present unnecessary barriers for candidates with disabilities or learning difficulties. We can put arrangements in place for these candidates to enable them to access the assessments and receive recognition of their attainment. We do not agree access arrangements if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who cannot access the assessment of any component may be able to receive an award based on the parts of the assessment they have completed.

Information on access arrangements is in the *Cambridge Handbook* at **www.cambridgeinternational.org/eoguide**

Language

This syllabus and the related assessment materials are available in English only.

After the exam

Grading and reporting

Grades A*, A, B, C, D or E indicate the standard a candidate achieved at Cambridge International A Level, with A* being the highest grade.

Grades a, b, c, d or e indicate the standard a candidate achieved at Cambridge International AS Level, with 'a' being the highest grade.

'Ungraded' means that the candidate's performance did not meet the standard required for the lowest grade (E or e). 'Ungraded' is reported on the statement of results but not on the certificate. In specific circumstances your candidates may see one of the following letters on their statement of results:

- Q (pending)
- X (no result)
- Y (to be issued).

These letters do not appear on the certificate.

If a candidate takes a Cambridge International A Level and fails to achieve grade E or higher, a Cambridge International AS Level grade will be awarded if both of the following apply:

- the components taken for the Cambridge International A Level by the candidate in that series included all the components making up a Cambridge International AS Level
- the candidate's performance on the AS Level components was sufficient to merit the award of a Cambridge International AS Level grade.

On the statement of results and certificates, Cambridge International AS & A Levels are shown as General Certificates of Education, GCE Advanced Subsidiary Level (GCE AS Level) and GCE Advanced Level (GCE A Level).

'Cambridge International A Levels are the 'gold standard' qualification. They are based on rigorous, academic syllabuses that are accessible to students from a wide range of abilities yet have the capacity to stretch our most able.'

Director of Studies, Auckland Grammar School, New Zealand

How students, teachers and higher education can use the grades

Cambridge International A Level

Assessment at Cambridge International A Level has two purposes:

- to measure learning and achievement
  The assessment:
  - confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus, to the levels described in the grade descriptions.

- to show likely future success
  The outcomes:
  - help predict which students are well prepared for a particular course or career and/or which students are more likely to be successful
  - help students choose the most suitable course or career.

Cambridge International AS Level

Assessment at Cambridge International AS Level has two purposes:

- to measure learning and achievement
  The assessment:
  - confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus.

- to show likely future success
  The outcomes:
  - help predict which students are well prepared for a particular course or career and/or which students are more likely to be successful
  - help students choose the most suitable course or career
  - help decide whether students part way through a Cambridge International A Level course are making enough progress to continue
  - guide teaching and learning in the next stages of the Cambridge International A Level course.

Grade descriptions

Grade descriptions are provided to give an indication of the standards of achievement candidates awarded particular grades are likely to show. Weakness in one aspect of the examination may be balanced by a better performance in some other aspect.

Grade descriptions for Cambridge International A Level Information Technology will be published after the first assessment of the A Level in 2022. Find more information at **www.cambridgeinternational.org/alevel**

Changes to this syllabus for 2022, 2023 and 2024

The syllabus has been reviewed and revised for first examination in 2022.

You are strongly advised to read the whole syllabus before planning your teaching programme.

From 2022, the A Level components will assume knowledge of the **revised** AS Level content. All candidates should therefore be familiar with the AS Level content in this syllabus.

The latest syllabus is version 2, published September 2020.

Changes to syllabus content	- In Section 8.3 on page 19 of the syllabus, rtf has been removed from Import and export data. - In Section 10.1 on page 21 of the syllabus, pivot table has been removed from Perform searches. - In Section 10.1 on page 21 of the syllabus, rtf has been removed from Import data. - In Section 11.1 on page 23 of the syllabus, crop has been removed from Edit a video clip to meet the requirements of its intended application and audience. - In Section 12.2 on page 25 of the syllabus, Data protection in Process of data mining has been changed to Data preparation. - A pseudocode guide will be published for this syllabus in September 2020, see page 5 of the syllabus.

Changes to the subject content are indicated by black vertical lines either side of the text.

Changes to version 1 of the syllabus, published September 2019

Changes to syllabus content	- The learner attributes have been updated. - Small changes have been made to the key concepts to better reflect the overarching ideas that run throughout Information Technology. - The subject content has been moved to a two column format. The format change has allowed us to restructure the subject content and include guidance designed to help teachers understand the scope of the topics. Changes to the content also take account of the definitions of the standard command words which have been included in the syllabus. - The wording in the learning outcomes has been updated to provide clarity to what depth each topic should be taught and better support progression between IGCSE, AS Level and A Level. Although the wording will look different in many places, the content to teach remains largely the same. - There has been a limited amount of change to topics: some topics have been removed and others added, and some content has moved from AS Level to A Level and vice versa; but the teaching time still falls within the recommended guided learning hours. - The list of command words has been updated.

Changes to assessment (including changes to specimen papers)	• The syllabus aims have been updated to improve the clarity of wording. • The wording of the assessment objectives (AOs) has been updated to improve clarity. These changes do not affect the meaning or focus of the assessment objectives. • We have reduced the number of marks on the theory and practical papers.

In addition to reading the syllabus, you should refer to the updated specimen papers. The specimen papers will help your students become familiar with exam requirements and command words in questions. The specimen mark schemes explain how students should answer questions to meet the assessment objectives.

Any textbooks endorsed to support the syllabus for examination from 2022 are suitable for use with this syllabus.

'While studying Cambridge IGCSE and Cambridge International A Levels, students broaden their horizons through a global perspective and develop a lasting passion for learning.'

Zhai Xiaoning, Deputy Principal, The High School Affiliated to Renmin University of China