

**MARK SCHEME**

**Duration:** 2 hours 30 minutes

**MAXIMUM MARK 140**

**This document consists of 38 pages**

## MARKING INSTRUCTIONS

### PREPARATION FOR MARKING SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the **required number** of practice responses (“scripts”) and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

### MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the scoris messaging system, or by email.
5. **Crossed Out Responses**  
Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

#### **Rubric Error Responses – Optional Questions**

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. (*The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.*)

**Multiple Choice Question Responses**

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

*When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

**Contradictory Responses**

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

**Short Answer Questions** (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

**Short Answer Questions** (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

**Longer Answer Questions** (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.
7. Award No Response (NR) if:
  - there is nothing written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**  
If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.
9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.
10. For answers marked by levels of response: Not applicable in F501
  - a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
  - b. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

## 11. Annotations

Annotation	Meaning
	Omission mark
<b>BOD</b>	Benefit of the doubt
<b>E</b>	Subordinate clause / consequential error
	Incorrect point
<b>E</b>	Expansion of a point
<b>FT</b>	Follow through
<b>NAQ</b>	Not answered question
<b>NBOD</b>	No benefit of doubt given
<b>P</b>	Point being made
<b>REP</b>	Repeat
	Correct point
<b>TV</b>	Too vague
<b>0</b>	Zero (big)
<b>BP</b>	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
<b>L1</b>	Level 1
<b>L2</b>	Level 2
<b>L3</b>	Level 3

## 12. Subject Specific Marking Instructions

### INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper and its rubrics
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

**USING THE MARK SCHEME**

Please study this Mark Scheme carefully. The Mark Scheme is an integral part of the process that begins with the setting of the question paper and ends with the awarding of grades. Question papers and Mark Schemes are developed in association with each other so that issues of differentiation and positive achievement can be addressed from the very start.

This Mark Scheme is a working document; it is not exhaustive; it does not provide 'correct' answers. The Mark Scheme can only provide 'best guesses' about how the question will work out, and it is subject to revision after we have looked at a wide range of scripts.

The Examiners' Standardisation Meeting will ensure that the Mark Scheme covers the range of candidates' responses to the questions, and that all Examiners understand and apply the Mark Scheme in the same way. The Mark Scheme will be discussed and amended at the meeting, and administrative procedures will be confirmed. Co-ordination scripts will be issued at the meeting to exemplify aspects of candidates' responses and achievements; the co-ordination scripts then become part of this Mark Scheme.

Before the Standardisation Meeting, you should read and mark in pencil a number of scripts, in order to gain an impression of the range of responses and achievement that may be expected.

In your marking, you will encounter valid responses which are not covered by the Mark Scheme: these responses must be credited. You will encounter answers which fall outside the 'target range' of Bands for the paper which you are marking. Please mark these answers according to the marking criteria.

Please read carefully all the scripts in your allocation and make every effort to look positively for achievement throughout the ability range. Always be prepared to use the full range of marks.

**LEVELS OF RESPONSE QUESTIONS:**

The indicative content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.

Using 'best-fit', decide first which set of BAND DESCRIPTORS best describes the overall quality of the answer. Once the band is located, adjust the mark concentrating on features of the answer which make it stronger or weaker following the guidelines for refinement.

- **Highest mark:** If clear evidence of all the qualities in the band descriptors is shown, the HIGHEST Mark should be awarded.
- **Lowest mark:** If the answer shows the candidate to be borderline (i.e. they have achieved all the qualities of the bands below and show limited evidence of meeting the criteria of the band in question) the LOWEST mark should be awarded.
- **Middle mark:** This mark should be used for candidates who are secure in the band. They are not 'borderline' but they have only achieved some of the qualities in the band descriptors.

Be prepared to use the full range of marks. Do not reserve (e.g.) high Band 3 marks 'in case' something turns up of a quality you have not yet seen. If an answer gives clear evidence of the qualities described in the band descriptors, reward appropriately.

	<b>AO1</b>	<b>AO2</b>	<b>AO3</b>
<b>High (thorough)</b>	Precision in the use of question terminology. Knowledge shown is consistent and well-developed. Clear appreciation of the question from a range of different perspectives making extensive use of acquired knowledge and understanding.	Knowledge and understanding shown is consistently applied to context enabling a logical and sustained argument to develop. Examples used enhance rather than detract from response.	Concerted effort is made to consider all aspects of a system / problem or weigh up both sides to an argument before forming an overall conclusion. Judgements made are based on appropriate and concise arguments that have been developed in response resulting in them being both supported and realistic.
<b>Middle (reasonable)</b>	Awareness of the meaning of the terms in the question. Knowledge is sound and effectively demonstrated. Demands of question understood although at times opportunities to make use of acquired knowledge and understanding not always taken.	Knowledge and understanding applied to context. Whilst clear evidence that an argument builds and develops through response there are times when opportunities are missed to use an example or relate an aspect of knowledge or understanding to the context provided.	There is a reasonable attempt to reach a conclusion considering aspects of a system / problem or weighing up both sides of an argument. However the impact of the conclusion is often lessened by a lack of supported judgements which accompany it. This inability to build on and develop lines of argument as developed in the response can detract from the overall quality of the response.
<b>Low (basic)</b>	Confusion and inability to deconstruct terminology as used in the question. Knowledge partial and superficial. Focus on question narrow and often one-dimensional.	Inability to apply knowledge and understanding in any sustained way to context resulting in tenuous and unsupported statements being made. Examples if used are for the most part irrelevant and unsubstantiated.	Little or no attempt to prioritise or weigh up factors during course of answer. Conclusion is often dislocated from response and any judgements lack substance due in part to the basic level of argument that has been demonstrated throughout response.

	<b>Assessment Objective</b>
<b>AO1</b>	Demonstrate knowledge and understanding of the principles and concepts of computer science, including abstraction, logic, algorithms and data representation.
<b>AO1.1</b>	Demonstrate <b>knowledge</b> of the principles and concepts of abstraction, logic, algorithms, data representation or other as appropriate.
<b>AO1.2</b>	Demonstrate <b>understanding</b> of the principles and concepts of abstraction, logic, algorithms, data representation or other as appropriate.
<b>AO2</b>	Apply knowledge and understanding of the principles and concepts of computer science including to analyse problems in computational terms.
<b>AO2.1</b>	Apply knowledge and understanding of the principles and concepts of computer science.
<b>AO2.2</b>	Analyse problems in computational terms.
<b>AO3</b>	Design, program and evaluate computer systems that solve problems, making reasoned judgements about these and presenting conclusions.
<b>AO3.1</b>	Design computer systems that solve problems.
<b>AO3.2</b>	Program computer systems that solve problems.
<b>AO3.3</b>	Evaluate computer systems that solve problems, making reasoned judgements about these and presenting conclusions.

Question			Answer	Mark	Guidance
1	a	i	<ul style="list-style-type: none"><li>- (Single) Control Unit</li><li>- (Single) Arithmetic Logic Unit</li><li>- (Special) registers within CPU</li><li>- Instructions and Data stored in same area of memory</li><li>- Instructions and Data stored in same format</li><li>- A single set of buses / same bus for instructions &amp; data (to connect CPU to Memory and I/O)</li></ul> <p>(1 Mark per -, Max 2)</p>	2 (AO1.1)	Accept acronyms ALU, CU

		<p>ii Two separate areas of memory... ...one for instructions &amp; one for data./instructions and data can be accessed concurrently.</p> <p>Different (sets of) buses... ... one for instructions &amp; one for data./ instructions and data can be accessed concurrently.</p> <p>Pipelining... ...whilst an instruction is being executed the next can be decoded and the subsequent one fetched.</p> <p>Use of Cache... ...A small amount of high performance memory is (next to the CPU) / which stores frequently used data/instructions</p> <p>Virtual cores/Hyper-threading™ ... ...Treating a physical core as two virtual cores.</p> <p>Multiple Cores... ...Each core acts as a separate processing unit.</p> <p>Onboard Graphics... ...Built in circuitry for graphics processing.</p> <p>(1 Mark for identifying feature, 1 mark for description)</p>	<p>2 (AO1.2)</p>	<p>Accept any reasonable description.</p> <p>Do not accept “64-bit”</p> <p>e.g. Performance boosting mode... ...Clock speed can be temporarily increased for performance boost.</p> <p>Out of Order Execution... ...Instructions can be executed before earlier ones if they are ready.</p> <p>Super Scalar... ...Multiple instructions can be executed simultaneously.</p>
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	b	i	<table border="1" data-bbox="383 209 936 592"> <thead> <tr> <th>Input</th> <th>Green Light</th> <th>Red Light</th> </tr> </thead> <tbody> <tr><td>1</td><td>✓</td><td></td></tr> <tr><td>2</td><td>✓</td><td></td></tr> <tr><td>3</td><td>✓</td><td></td></tr> <tr><td>4</td><td>✓</td><td></td></tr> <tr><td>5</td><td>✓</td><td></td></tr> <tr><td>6</td><td></td><td>✓</td></tr> <tr><td>7</td><td></td><td>✓</td></tr> <tr><td>8</td><td></td><td>✓</td></tr> <tr><td>9</td><td></td><td>✓</td></tr> </tbody> </table> <p data-bbox="573 635 936 699" style="text-align: center;">Rows 1-4 correct 1 Mark Rows 5-9 correct 1 Mark</p>	Input	Green Light	Red Light	1	✓		2	✓		3	✓		4	✓		5	✓		6		✓	7		✓	8		✓	9		✓	2 (AO3.3)	Accept T for a tick. Penalise if blank table elements have content.
Input	Green Light	Red Light																																	
1	✓																																		
2	✓																																		
3	✓																																		
4	✓																																		
5	✓																																		
6		✓																																	
7		✓																																	
8		✓																																	
9		✓																																	
		ii	<ul style="list-style-type: none"> <li>- The value 11 is stored in the MAR.</li> <li>- 11 is sent down the address bus.</li> <li>- A read signal is sent down the control bus.</li> <li>- <u>Q</u> is sent (back from memory) down the data bus.</li> <li>- 0 is stored in the MDR...</li> <li>- ...and then copied to the ACC</li> </ul> <p data-bbox="383 1038 685 1070">(1 Mark per -, max 6)</p>	6 (AO1.2)																															

		iii	<ul style="list-style-type: none"><li>- Takes in a value from user.</li><li>- If value is 5 or less it shows green</li><li>- Otherwise it shows Red</li></ul> <p>(1 Mark per -, max 3)</p>	3 (AO 3.2)	<p>Do not credit structured English</p> <p>Example</p> <pre>value = input("Enter a Value") if value &lt;=5 then     print("GREEN") else     print("RED") endif</pre> <p>Accept equivalents to <math>\leq 5</math> (e.g. <math>&lt;6</math>) For Green/Red (or 1/0) accept any pseudocode equivalent (GreenLightOn(), Output 1, print(1) Output Green etc.) as long as the logic is correct.</p>
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	iv	<p><b>Mark Band 3–High Level (7-9 marks)</b> The candidate demonstrates a thorough knowledge and understanding of assembly code and high level languages. The material is generally accurate and detailed.</p> <p>The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.</p> <p>The candidate provides a thorough discussion which is well balanced. Evaluative comments are consistently relevant and well-considered.</p> <p>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p><b>Mark Band 2-Mid Level (4-6 marks)</b> The candidate demonstrates reasonable knowledge and understanding assembly code and high level languages; the material is generally accurate but at times underdeveloped.</p> <p>The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.</p> <p>The candidate provides a sound discussion, the majority of which is focused. Evaluative comments are for the most part appropriate, although one or two opportunities for development are missed.</p>	<p><b>9</b></p> <p>AO1.1 (2) AO1.2 (2) AO2.1 (2) AO3.3 (3)</p>	<p><b>AO1</b> Assembly code uses mnemonics to represent machine code instructions/opcodes. High level languages use more natural/mathematical notation. Assembly code consists of simple instructions As such many more lines of assembly code are required to perform the same task as a few lines of a high level language. Assembly code is specific to the instruction set of a given processor. High Level languages are not architecture specific.</p> <p><b>AO2</b> Assembly code allows the programmer to choose the exact instructions so they can write code that is highly efficient. It also allows them to have direct control of how memory is used via addressing modes. Direct control of hardware. High level language compilers have optimisers that can also try and do this (and in some cases may outperform a human writing in assembly code).</p> <p>As high level code is more intuitive and easier to read it is easier to follow, debug and build as part of a team. It can also be written in a much shorter time frame. The high level code can be recompiled for different architectures. High level languages come in a variety of paradigms so programmers can choose according to the problem/their preference.</p>
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		<p>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</p> <p><b>Mark Band 1-Low Level (1-3 marks)</b>  The candidate demonstrates a basic knowledge assembly code and high level languages; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.</p> <p>The candidate provides a limited discussion which is narrow in focus. Judgments if made are weak and unsubstantiated. The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p> <p><b>0 marks</b>  No attempt to answer the question or response is not worthy of credit.</p>		<p><b>AO3</b>  Assembly language is best suited to situations such as:  -compilers or interpreters don't exist for the target CPU  i.e. embedded systems  -highest possible performance is critical  -memory is very limited.  For larger projects which don't fall under the constraints above high level languages are likely to be preferable.</p>
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Question			Answer	Mark	Guidance
2	a	i	<ul style="list-style-type: none"> <li>- Provide a (user) interface</li> <li>- Manage hardware/peripherals</li> <li>- Manage CPU usage / handles interrupts</li> <li>- Provide security</li> <li>- Provide platform to run other software</li> <li>- Provide utilities for system maintenance</li> </ul> (1 Mark per -, Max 3)	3 (AO1.1)	If candidate names utility software, allow BP6
		ii	Paging	1 (AO1.1)	
		iii	<ul style="list-style-type: none"> <li>- Operating system uses area of secondary storage as virtual memory.</li> <li>- Move unused pages/parts (of program A and/or B) into virtual memory</li> <li>- Load program C into (physical) memory.</li> </ul> (1 Mark per -, Max 3)	3 (AO2.1)	

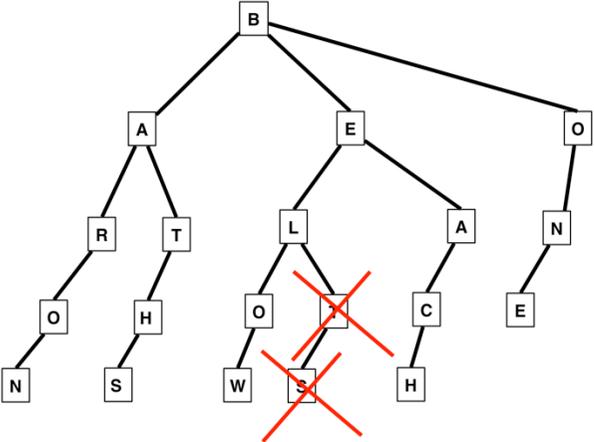
	b	i	<ul style="list-style-type: none"> <li>- Tags to make “Features” a heading (accept h1, h2, h3 etc.)</li> <li>- Correct use of ol</li> <li>- Correct use of li tags</li> <li>- Use of &lt;a tag Around the text “Download the Factsheet”</li> <li>- correct use of href=”factsheet.pdf”</li> </ul> <p>(1 Mark per -, max 5)</p>	<p>5 (AO3.2)</p>	<p>For making Features a heading only accept <b>strong/b</b> if accompanied by code to increase font size.</p> <pre>&lt;h1&gt;Features&lt;/h1&gt; The new OCR Smart Watch: &lt;ol&gt; &lt;li&gt;Uses the CB2 RISC processor for long battery life&lt;/li&gt; &lt;li&gt;Stores up to 20hrs of music&lt;/li&gt; &lt;li&gt;Tracks fitness&lt;/li&gt; &lt;/ol&gt; &lt;a href="factsheet.pdf"&gt;Download The Factsheet&lt;/a&gt;</pre> <p>Li close tags are optional</p>
		ii	<ul style="list-style-type: none"> <li>- A program called a spider/crawler/bot</li> <li>- Traverses the web / following the links.</li> <li>- It takes each word in the document</li> <li>- ...It adds an entry for the page (under the word) in the index...</li> <li>- ...alongside the word’s position on the page.</li> </ul> <p>(1 Mark per -, Max 3)</p>	<p>3 (AO2.1)</p>	
		iii	<ul style="list-style-type: none"> <li>- RISC has a smaller instruction set (than CISC)</li> <li>- Requires fewer transistors / less complex circuitry</li> <li>- Means less power is required.</li> </ul> <p>(1 Mark per -, Max 3)</p>	<p>3 (AO1.2)</p>	

Question		Answer	Mark	Guidance	
3	a	<ul style="list-style-type: none"> <li>- Gets/selects/outputs the flight numbers from the 'Flight' table</li> <li>- Of flights with the destination JFK</li> <li>- It returns OC0089 and OC7750</li> </ul> (1 Mark per -, Max 2)	2 (AO2.2)		
	b	<ul style="list-style-type: none"> <li>- SELECT * changed to DELETE</li> <li>- Halifax changed to Heathrow DestinationName='Heathrow' / DestinationCode='LHR'</li> <li>- Added AND DepartureDate=4/7/18</li> </ul> (1 Mark per -, Max 3)	3 (AO3.2)	DELETE FROM Flight WHERE DestinationName='Heathrow' AND DepartureDate=4/7/18  Accept quotation marks or #s around the date.  Do not give first mark if asterisk is kept (i.e. DELETE *)  The Departure Date condition could be placed before the Destination Name.	
	c	i	It is not unique/ the same value can appear in multiple records	1 (AO2.1)	
		ii	It is likely to be used to search for / index / sorted on	1 (AO2.1)	
	d	i	<ul style="list-style-type: none"> <li>-No Repeating fields/data</li> <li>-Data is atomic</li> <li>-Has a primary Key</li> </ul> (1 Mark per -, max 2)	2 (AO2.1)	

		ii	-Is in First Normal Form -Every field is dependent on the primary key.  (1 Mark per -, max 2)	2 (AO2.1)	
		iii	- Has a transitive relationship/ A non-key field depends on another non-key field. - DestinationName depends on DestinationCode (1 Mark per -, max 2)	2 (AO1.2)	
	e		- CSV/Comma Separated Value (file)... - A (text) file/format with values separated by commas (or some other delimiter)  - XML/eXstensible Markup Language... - ...A markup language that uses tags to denote data.  - SQL/Structured Query Language... - ...A language for creating/querying databases  Accept any reasonable answer. 1 mark for naming method, 1 mark for valid description.	2 (AO2.1)	Other examples include: - RSS/Really Simple Syndication/Rich Site Summary... - ....A URL is given which points to an XML file which is periodically checked by a browser/program. - API/Application Programming Interface... - ...A prewritten set of subroutines/interfaces that provide access to the company's data.  - JSON/JavaScript Object Notation... - ...text format that can easily be changed to and from JavaScript Objects.  Candidates may provide other valid answers (e.g. REST, SOAP etc.).  Descriptions may differ from those given. Accept any <u>valid</u> description.

Question		Answer	Mark	Guidance
4	a	<ul style="list-style-type: none"> <li>- Wide Area Network</li> <li>- Collection of connected computers/devices over a large geographical area</li> <li>- Often using 3<sup>rd</sup> party communications channels</li> </ul> (1 Mark per -, max 2)	2 (AO1.1)	
	b	i <ul style="list-style-type: none"> <li>- Allowing them to communicate</li> <li>- By ensuring all devices follow the same rules/standards</li> <li>- So they interpret data/signals in the same way</li> </ul> (1 Mark per -, max 2)	2 (AO1.2)	
		ii <ul style="list-style-type: none"> <li>-Application</li> <li>-Transport</li> <li>-Internet</li> <li>-Network Interface/(Data) Link/Physical</li> </ul> (1 Mark per -, max 4)	4 (AO1.1)	

Question		Answer	Mark	Guidance
5	a	<p>Foot mouse/pedal... ... press key/click button to send signal.</p> <p>Camera/eye tracker... ...Move/blink to send signal</p> <p>Microphone... ...Make sound to send signal</p> <p>Puff/suck switch... ..blow/suck to send signal.</p> <p>Accept any sensible answer. 1 mark for naming of input device, 1 mark for use.</p>	<p>2 (AO2.1) Identify (1), AO2.2) Describe (1)</p>	<p>First mark must be hardware not software</p>
	b	i	<p>2 (AO2.1)</p>	<p>- T and S removed /T removed/Link between L and T removed... - ...No further nodes removed</p> <p>(1 Mark per -, Max 2)</p> <pre> graph TD     B[B] --- A[A]     B[B] --- E[E]     A[A] --- R[R]     A[A] --- T[T]     R[R] --- O1[O]     R[R] --- H[H]     O1[O] --- N[N]     H[H] --- S1[S]     E[E] --- L[L]     E[E] --- Unlabeled[ ]     L[L] --- O2[O]     L[L] --- S2[S]     Unlabeled[ ] --- T2[T]     style O2 stroke:#f00,stroke-width:2px     style S2 stroke:#f00,stroke-width:2px     style T2 stroke:#f00,stroke-width:2px     linkStyle 10 stroke:#f00,stroke-width:2px     </pre>

		<p>ii</p>	<ul style="list-style-type: none"> <li>- BEACH added</li> <li>- BONE added</li> </ul> <p>(1 Mark per -, Max 2)</p>	<p>2 (AO2.1)</p>	 <p>Whether branches point left or right or order of branches is irrelevant. As long as branches form the words without unnecessary repetition of nodes, award the marks.</p>
	<p>c</p>		<ul style="list-style-type: none"> <li>- Free of cost</li> <li>- Right to inspect/amend/recompile <u>source code</u></li> <li>- Can tailor the program to their specific needs</li> <li>- Code open for bugs to be spotted and fixed.</li> </ul> <p>(1 Mark per -, Max 2)</p>	<p>2 (AO1.2)</p>	

6		<p><b>Mark Band 3–High Level (9-12 marks)</b> The candidate demonstrates a thorough knowledge and understanding of computing related laws and modern issues that fall under them. The material is generally accurate and detailed.</p> <p>The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.</p> <p>The candidate is able to assess the extent to which the law is able to keep up with changes in technology.</p> <p>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p><b>Mark Band 2-Mid Level (5-8 marks)</b> The candidate demonstrates reasonable knowledge and understanding of computing related laws and modern issues that fall under them; the material is generally accurate but at times underdeveloped.</p> <p>The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.</p> <p>The candidate makes a reasonable attempt to come to a conclusion as to whether the law is able</p>	<p>12</p> <p>AO1.1 (2)</p> <p>AO1.2 (2)</p> <p>AO2.1 (3)</p> <p>AO3.3 (5)</p>	<p>Points may include but aren't limited to:</p> <p><b>AO1 Knowledge and Understanding</b> Laws that regulate technology include: the Data Protection Act... ...which regulates how personal data is stored. The Computer Misuse Act... ...which regulates unauthorised access. The Copyright and Patents Act... ...regulated intellectual property. Regulation of Investigatory Powers Act... ...Regulates how government agencies can use IT for surveillance</p> <p><b>AO2 Application</b> Computer Misuse Act is harder to enforce with the increased use of DDoS attacks (often involving unwitting participants). The Internet of things is likely to make such attacks even more common place. People are connecting to the internet in new ways using mobile networks/public Wi-Fi making attacks potentially difficult to track.</p> <p>Films/Music etc. are being shared in new ways. Streaming is common – often this is legitimate but the global nature of it can bring licensing issues into play. Fast internet speeds, peer to peer and the dark web all contribute to making piracy more prevalent and harder to track. Digital watermarking can be used to track piracy. End to end encryption makes government monitoring of communications trickier.</p>
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		<p>to keep up with changes in technology.</p> <p>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</p> <p><b>Mark Band 1-Low Level (1-4 marks)</b> The candidate demonstrates a basic knowledge of computing related laws and modern issues that fall under them; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.</p> <p>The candidate provides nothing more than an unsupported assertion.</p> <p>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p> <p><b>0 marks</b> No attempt to answer the question or response is not worthy of credit.</p>		<p><b>AO3 Evaluation</b> May conclude that although technology develops quickly the laws are broad enough to cover all eventualities. Alternatively, may conclude that people are always looking for ways of using technology to access loophole in the law / to avoid detection. Look for a well-reasoned conclusion. Could decide either for or against but should be backed up with examples.</p>
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Question		Answer	Mark	Guidance
7	a	<ul style="list-style-type: none"> <li>- Needs to be able to respond instantly to changes...</li> <li>- ...such as someone stepping in front of car (or other sensible example)</li> <li>- RTOS offers a guaranteed response time.</li> <li>- A non RTOS might be busy dealing with other tasks and not respond until it is too late.</li> </ul> <p>(1 Mark per -, Max 3)</p>	3 (AO1.2)	
	b	<ul style="list-style-type: none"> <li>- Created Obstacle object called bollard</li> <li>- Has put the correct arguments in, in the correct order.</li> </ul> <p>(1 Mark per -, Max 2)</p>	2 (AO3.2)	<p><b>Examples</b></p> <pre> bollard=new Obstacle(false, 7.8, 8) Obstacle bollard = Obstacle(false, 7.8, 8); bollard=Obstacle(False, 7.8, 8) </pre> <p>Do not penalise for use of <code>self</code> parameter as used by languages such as Python.</p>
		<ul style="list-style-type: none"> <li>-The attribute <code>distance</code> is private...</li> <li>-...and therefore updated with the method <code>update distance</code></li> </ul>	2 (AO3.2)	

		iii	<ul style="list-style-type: none"><li>- Reduces the chance of errors/inconsistences</li><li>- Ensures objects can only be changed in the way intended/ Ensuring changes are consistent with how the object should behave</li><li>- Protecting data/ Can't be changed accidentally</li></ul> <p>(1 Mark per -, Max 2)</p>	2 (AO1.2)	Read 'securing' as 'protecting'
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	c	<p>- First line Clear use of inheritance of Obstacle. E.g.:</p> <pre> Person inherits Obstacle / Person extends Obstacle / Person : Obstacle / Person(Obstacle) </pre> <p>In the method</p> <ul style="list-style-type: none"> <li>- Less than 2 metres triggers brake</li> <li>- Equal to but not greater than 2 metres triggers brake.</li> <li>- Less than or equal to 2 metres triggers horn</li> <li>- Less than or equal to 5 metres triggers horn</li> </ul> <p>(1 Mark per -, Max 5)</p>	5 (AO3.2)	<pre> class Person inherits Obstacle    public procedure updateDistance(givenDistance)   if givenDistance&lt;=5 then     Controls.beepHorn()     if givenDistance&lt;=2 then       Controls.applyBrakes()     endif   endif distance = givenDistance endprocedure  endclass </pre> <p>NB a number of ways exist of writing the method – be careful of the logic. Two such correct examples are below.</p> <pre> if givenDistance&lt;=5 then   Controls.beepHorn() endif if givenDistance&lt;=2 then   Controls.applyBrakes() endif  if givenDistance&lt;=2 then   Controls.beepHorn()   Controls.applyBrakes() elseif givenDistance&lt;=5 then   Controls.beepHorn() endif </pre>
	d	Advantages of an automated driver are it is	2	

		<p style="text-align: center;">potentially:</p> <ul style="list-style-type: none"> <li>- safer than a human driver (due to quicker reaction speeds etc.).</li> <li>- cheaper as no wage to cover.</li> <li>- less likely to make mistakes with route.</li> </ul> <p>Disadvantages of an automated driver are it is potentially:</p> <ul style="list-style-type: none"> <li>- May not be able to understand natural speech.</li> <li>- May be limited in terms of the roads on which it can operate.</li> <li>- Vulnerable to hacking.</li> <li>- Only as good as the program running it – a bug in the code could cause catastrophic accidents.</li> <li>- May prioritise safety of pedestrians over that of the passenger. (e.g. may take actions that may put the passenger at risk to save the lives of numerous people outside the car.)</li> <li>- No discussion possible with the driver / no "human presence" to reassure nervous customers.</li> </ul> <p>Max 1 advantage and max 1 disadvantage</p>	(AO2.2)	
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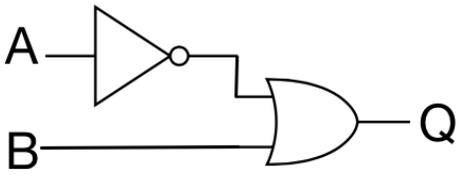
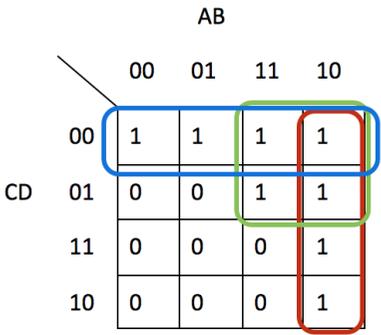
Question		Answer	Mark	Guidance																																																		
8	a	<ul style="list-style-type: none"> <li>- American Standard Code for Information Interchange</li> <li>- A character set</li> <li>- Maps values to characters</li> <li>- Uses 7-bits/ 8-bits per character</li> </ul> (1 Mark per -, Max 2)	2 (AO1.1)																																																			
	b	<p style="text-align: center;">Row shift as below (1 Mark)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>P</td><td>S</td><td>E</td><td>T</td><td>O</td></tr> <tr><td>E</td><td>T</td><td>M</td><td>C</td><td>R</td></tr> <tr><td>S</td><td>A</td><td>G</td><td>E</td><td>S</td></tr> <tr><td>R</td><td>P</td><td>L</td><td>E</td><td>Y</td></tr> <tr><td>G</td><td>G</td><td>Q</td><td>U</td><td>O</td></tr> </table> <p style="text-align: center;">Column Shift as below (1 Mark)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>G</td><td>G</td><td>Q</td><td>U</td><td>O</td></tr> <tr><td>P</td><td>S</td><td>E</td><td>T</td><td>O</td></tr> <tr><td>E</td><td>T</td><td>M</td><td>C</td><td>R</td></tr> <tr><td>S</td><td>A</td><td>G</td><td>E</td><td>S</td></tr> <tr><td>R</td><td>P</td><td>L</td><td>E</td><td>Y</td></tr> </table>	P	S	E	T	O	E	T	M	C	R	S	A	G	E	S	R	P	L	E	Y	G	G	Q	U	O	G	G	Q	U	O	P	S	E	T	O	E	T	M	C	R	S	A	G	E	S	R	P	L	E	Y	2 (AO1.2)	cao
P	S	E	T	O																																																		
E	T	M	C	R																																																		
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R	P	L	E	Y																																																		
	c	- Procedure correctly defined with	4	When checking to see if out of bounds exception																																																		

		<p>parameters.</p> <ul style="list-style-type: none"> <li>- Procedure manipulates the correct row of grid.</li> <li>- Sensible use of for loop to iterate through the array without generating out of bounds exception.</li> <li>- Correctly shifts each row.</li> </ul> <p>(1 Mark per -, Max 4)</p>	(AO3.1)	<p>keep in mind that in some languages the loop boundaries are exclusive. When unsure give the benefit of the doubt. The final mark is meant to offer stretch and challenge. Be cautious of wrong answers on face value seems to work. For example, the following will <b>not</b> work:</p> <pre>procedure shiftRow(rowNumber, places)   for i = 0 to places     grid[rowNumber,i+1]= grid[rowNumber,i]   next i endprocedure</pre> <p>Possible solutions include...</p> <pre>procedure shiftRow(rowNumber, places)   array temp[5]   for i=0 to 4     temp[i]=grid[rowNumber,i]   next i   for i=0 to 4     newPos=(i+places)MOD 5 <b>//% is the same as MOD</b>     grid[rowNumber,newPos]=temp[i]   next i endprocedure</pre> <p>And..</p> <pre>procedure shiftRow(rowNumber, places)   for i=1 to places     temp1=grid[rowNumber, 4]     temp2=0     for j =0 to 4       temp2=grid[rowNumber,j]       grid[rowNumber,j]=temp1       temp1=temp2     next j   next i end procedure</pre> <p>Note: within solutions, allow for columns to be</p>
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					referenced first eg <code>grid[i, rowNumber]</code>
	d	<p><b>Mark Band 3–High Level (7-9 marks)</b> The candidate demonstrates a thorough knowledge and understanding of modern encryption and the difference between symmetric and asymmetric encryption. The material is generally accurate and detailed.</p> <p>The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.</p> <p>The candidate provides a thorough discussion which is well balanced. Evaluative comments are consistently relevant and well-considered.</p> <p>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p><b>Mark Band 2-Mid Level (4-6 marks)</b> The candidate demonstrates reasonable knowledge and understanding of modern encryption and the difference between symmetric and asymmetric encryption; the material is generally accurate but at times underdeveloped.</p> <p>The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly</p>	<p><b>9</b></p> <p>AO1.1 (2)</p> <p>AO1.2 (2)</p> <p>AO2.1 (2)</p> <p>AO3.3 (3)</p>	<p><b>AO1</b> Modern encryption is many orders stronger than that used in a pre-computer era. Asymmetric encryption uses different keys for encryption and decryption. Symmetric encryption uses the same key for encryption and decryption. Asymmetric encryption algorithms tend to involve more processing than symmetric algorithms.</p> <p><b>AO2</b> Modern encryption can be used without specialist knowledge. Often users may not even be aware their data is being encrypted (e.g. HTTPS, messaging systems) Asymmetric encryption is often used when exchanging data. For example credit card details over the internet. Symmetric encryption is best suited when the same person is encrypting and decrypting. For example when backing up data.</p> <p><b>AO3</b> The strength and ease of use of encryption has made it widely used on the Internet. E-Commerce would not be possible without it. Governments are no longer able to easily crack encrypted messages they intercept (as far as we know). This gives individuals unprecedented levels of</p>	

		<p>relevant to the explanation.</p> <p>The candidate provides a sound discussion, the majority of which is focused. Evaluative comments are for the most part appropriate, although one or two opportunities for development are missed.</p> <p>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</p> <p><b>Mark Band 1-Low Level (1-3 marks)</b> The candidate demonstrates a basic knowledge modern encryption and the difference between symmetric and asymmetric encryption; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.</p> <p>The candidate provides a limited discussion which is narrow in focus. Judgments if made are weak and unsubstantiated. The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p> <p><b>0 marks</b> No attempt to answer the question or response is not worthy of credit</p>		<p>privacy But also means those communicating for nefarious purposes can do so undetected.</p>
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Question		Answer	Mark	Guidance
9	a	10101001 ← Answer, 1 Mark 111111 ← Carry bits, 1 Mark	2 (AO1.2)	
	b	1 0 <del>2</del> 2 ← Borrowed bits, 1 Mark <del>1100</del> 1111 <u>00111001</u> 10010110 ← Answer, 1 Mark	2 (AO1.2)	Allow 2 marks for any other valid method with working shown.  If converted to denary and calculated, no marks.
	c	370F 1 Mark for the first two digits (i.e. 37) 1 Mark for the last two digit (i.e. 0F)	2 (AO1.2)	
	d	-Exponent is 2 -Mantissa becomes 010.01 -Value is 2.25 (1 Mark per -, Max 3)	3 (AO1.2)	
	e	01100 0000  1 Mark for mantissa, 1 mark for exponent.  10000 0100  1 Mark for mantissa, 1 mark for exponent.	4 (AO1.2)	
	f	10111001	1 (AO1.2)	cao
	g	11111111	1 (AO1.2)	cao

Question		Answer	Mark	Guidance
10	a	 <p>- A going into NOT gate.                      - B and NOT A going into OR gate (and Q coming out of it)                      (1 Mark per -, Max 2)</p>	2 (AO1.2)	
	b	<p>-Groups correctly identified (with no further groups).                      - Answer includes <math>\neg C \wedge \neg D</math>                      - Answer includes <math>A \wedge \neg B</math>                      - Answer includes <math>A \wedge \neg C</math>                      - All three sections joined with <math>\vee</math>s in any order but with no further sections.                      E.g.  <math>(A \wedge \neg B) \vee (A \wedge \neg C) \vee (\neg C \wedge \neg D)</math>                      The brackets aren't necessary                      (1 Mark per -, Max 5)</p>	5 (AO1.2)	

Question	Assessment Objectives							Total
	AO1.1	AO1.2	AO2.1	AO2.2	AO3.1	AO3.2	AO3.3	
1ai	2							2
1aii		2						2
1bi							2	2
1bii		6						6
1biii						3		3
1biv	2	2	2				3	9
2ai	3							3
2aii			1					1
2aiii		3						3
2bi					5			5
2bii			3					3
2biii		3						3
3a				2				2
3b					3			3
3ci			1					1
3cii			1					1
3di			2					2
3dii			2					2
3diii		2						2
3e			2					2
4a	2							2
4bi		2						2
4bii	4							4

5a			1	1				2
5bi			2					2
5bii			2					2
5c		2						2
6	2	2	3				5	12
7a		3						3
7bi					2			2
7bii				2				2
7biii		2						2
7c					5			5
7d				2				2
8a	2							2
8b		2						2
8c					4			4
8d	2	2	2				3	9
9a		2						2
9b		2						2
9c		2						2
9d		3						3
9e		2						2
9f		2						2
9g		1						1
9h		1						1
10a		2						2
10b		5						5
								0
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<b>TOTALS</b>	19	55	24	7	19	3	13	140

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