GCE

Computer Science

H046/01: Computing principles

Advanced Subsidiary GCE

Mark Scheme for June 2019

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Annotation	Meaning
^	Omission mark
BOD	Benefit of the doubt
C	Subordinate clause / consequential error
	Incorrect point
E	Expansion of a point
FT	Follow through
NAQ	Not answered question
NBOD	No benefit of doubt given
P	Point being made
REP	Repeat
	Slash / half-mark
	Correct point
TV	Too vague
0	Zero (big)
BP	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.
L1	Level 1
L2	Level 2

L3	Level 3

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 **Examiner**s. 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.

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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.

	AO1	**AO2**	**AO3**
High (thorough)	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.
Middle (reasonable)	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

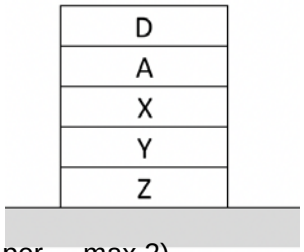
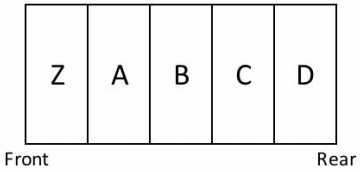
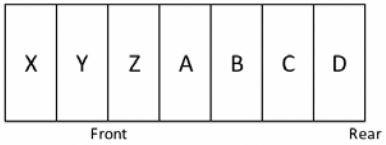
			lines of argument as developed in the response can detract from the overall quality of the response.
Low (basic)	Confusion and inability to deconstruct terminology as used in the question. Knowledge partial and superficial. Focus on question narrow and often one-dimensional.	Inability to apply knowledge 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.

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

Question			Answer	Marks	Comments
1	a		- Open source has the source code freely available… - … to amend/copy/redistribute/recompile - Whereas closed source is distributed in binary form only/the source code is not made available… - There are licensing conditions restricting the redistribution/there is no permission to amend the (program) code (1 per - , max 4)	4 (AO1.1)	
	b		- Compilers translate the source code prior to distribution - Meaning the user gets an executable program (which makes amending of the program much more difficult). - Interpreters translate source code every time the program is run - meaning the user needs the source code to run the program - (1 per - , max 2)	2 (AO2.1)	
	c		An Assembler	1 (AO1.1)	
	d		- Provide a user interface - Provide System Security - Manage hardware - Provide utilities - Provide a platform from which software can be installed/run - Schedule jobs - Handle interrupts - Manage memory (1 per - , max 3)	3 (AO1.1)	
2	a		Hello – String 35 – Integer True - Boolean	3 (AO2.1)	
	b		00100011	1 (AO1.2)	

	c		- If A is 65, H is 72 - 72 in binary is 01001000	2 (AO2.1)	If step one is incorrect allow FT for second mark
	d		- -2.625 in fixed point is 101.011 - Binary point moves two places left giving 1.01011/Mantissa is 101011 - Exponent of 2 is 0010 Answer 101011 0010 (1 per - , max 3)	3 (AO1.2)	Give full marks if correct answer. Allow FT
3			Mark Band 3–High Level (7-9 marks) The candidate demonstrates a thorough knowledge and understanding of factors affecting processor performance; the material is generally accurate and detailed. 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. The candidate provides a thorough discussion which is well-balanced. Evaluative comments are consistently relevant and well-considered. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. Candidate has used appropriate technical terminology throughout. There are few if any spelling errors or errors of grammar. Mark Band 2 –Mid Level (4-6 marks) The candidate demonstrates reasonable knowledge and understanding of factors affecting processor performance; the material is generally accurate but at times underdeveloped. 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 The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are for the most part appropriate, although one or two opportunities for development are missed. There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported	9 AO1.1 (2) AO1.2 (2) AO2.1 (2) AO3.3 (3)	Number of cores has an impact… Each core is a processing unit… Giving the potential for multiple instructions to be run simultaneously. Depending on the situation 4 cores running at 100MHz may perform better than 1 core running at 300MHz. The amount of cache (and levels) will benefit performance… Cache helps reduce the bottleneck caused by RAM being slow. No matter how fast the clock speed, the access time to RAM will always be a limiting factor. Contemporary processors have performance enhancing features such as pipelining and out of order execution. Harvard architecture processors benefit from having separate data and instruction memories. In conclusion one cannot judge performance solely on clock speed as... A processor without cache may be outperformed by a processor with a slower clock speed but access to cache. Processors will have other performance enhancements such as pipelining. *Points above are for example only. Not all are needed for full marks nor do they represent all possible correct*

			by some evidence. There may be spelling errors or errors of grammar in the response but they are not obtrusive. Mark Band 1-Low Level (1-3 marks) The candidate demonstrates a basic knowledge of factors affecting processor performance; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. 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. There are likely to be spelling errors and/or errors of grammar, which will disrupt the flow of the response. 0 marks No attempt to answer the question or response is not worthy of credit.		*answers.*

4	a		A queue	1 (AO1.1)	
	b		- D at top of stack with A directly below it - X,Y,Z directly below A (with no other entries)  (1 per - , max 2)	2 (AO2.2)	Allow new drawing or amendment of original.
	c		- `pop()` - `pop()` - `push("A")` (1 per - , max 3)	3 (AO3.1)	
	d		- Z the front element AND correct front pointer - Followed directly by ABCD AND correct rear pointer (1 per - , max 2)  	2 (AO2.2)	Allow X and Y to still be visible if front pointer has been shifted 

5			Mark Band 3–High Level (7-9 marks) The candidate demonstrates a thorough knowledge and understanding of the regulation of the Internet; the material is generally accurate and detailed. 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. The candidate provides a thorough discussion which is well-balanced. Evaluative comments are consistently relevant and well-considered. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. Candidate has used appropriate technical terminology throughout. There are few if any spelling errors or errors of grammar. Mark Band 2 –Mid Level (4-6 marks) The candidate demonstrates reasonable knowledge and understanding of the regulation of the Internet; the material is generally accurate but at times underdeveloped. 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 The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are for the most part appropriate, although one or two opportunities for development are missed. There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence. There may be spelling errors or errors of grammar in the response but they are not obtrusive. Mark Band 1-Low Level (1-3 marks) The candidate demonstrates a basic knowledge of the regulation of the Internet; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply	9 AO1.1 (2) AO1.2 (2) AO2.1 (2) AO3.3 (3)	Anyone can put content onto the Internet. It can be hard to track down who put information up. People can make untrue claims or present biased information. There are certain crimes that have originated because of the internet (e.g. phishing and pharming) Other crimes have found new avenues through the internet (e.g. drugs, obscene materials etc.) Laws have been written to take into account the internet (e.g. RIPA in the UK). Traditional laws still apply to the Internet. Governments can apply laws in their jurisdictions… ..but may not be able to enforce them if content is from outside their country. It can be hard to track people down if they actively try to hide their identity. Regulation whilst difficult on the internet may be to some extent desirable. Education is important – teaching people about the risks of using the internet. Content is available to people of all ages and vulnerabilities.

			acquired knowledge and understanding to the context provided. 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. There are likely to be spelling errors and/or errors of grammar, which will disrupt the flow of the response. 0 marks No attempt to answer the question or response is not worthy of credit.		
6	a		- A data structure/holds multiple pieces of data… - Has a single identifier - Elements are accessed by an index - Holds data of the same data type - Elements are stored contiguously in computer memory (1 per - , max 2)	2 (AO1.2)	

	b		- Declaration of list/array.
			- for loop which runs ten times.
			- inputting name to correct location each iteration.
			- for loop/while loop which outputs each name.
			- names are formatted with numbers 1-10 and a dot preceding each one.
			
			(1 per - , max 5)
				5
				(AO3.2)
					Array Version
					`array names[9]`
					`for i = 0 to 9`
					`  names[i]=input("Enter a name: ")`
					`next i`
					`for i= 0 to 9`
					`  print((i+1)+". "+names[i])`
					`next i`
					List Version
					`names = []`
					`for i = 0 to 9`
					`  names.append(input("Enter a name: "))`
					`next i`
					
					`for i= 0 to 9`
					`  print((i+1)+". "+names[i])`
					`next i`
					Allow 0 or 1 based array, provided code is consistent.

<table>
<tr><td>7</td><td>a</td><td></td><td>
<table>
<tr><th>Scenario</th><th>Computer Misuse Act</th><th>Copyright Design and Patents Act</th><th>Data Protection Act</th></tr>
<tr><td>A bank accidentally publishes customers' account details on its website.</td><td></td><td></td><td>✓</td></tr>
<tr><td>Someone downloads a pirated version of a piece of software that users would ordinarily have to pay for.</td><td></td><td>✓</td><td></td></tr>
<tr><td>Someone writes and distributes a virus.</td><td>✓</td><td></td><td></td></tr>
</table>
1 Mark per row</td><td>3
(AO2.1)</td><td></td></tr>
<tr><td></td><td>b</td><td></td><td>- Sets out to empower/ limit the extent...
- to which <u>public bodies</u> …
- can use technological surveillance..
- This can include monitoring internet activity
- Electronic communications
- And forcing users to hand over encryption keys
(1 per - , max 3)</td><td>3
(AO1.2)</td><td></td></tr>
<tr><td>8</td><td>a</td><td></td><td>- for ordered list
- for each item
- and around Book tickets

For points 1 and 2 also allow numbers typed in providing line breaks have been added.

e.g.
1. Macbeth

2. Blood Brothers

3. An Inspector Calls
</td><td>3
(AO3.2)</td><td>Upcoming productions:

Macbeth
 Blood Brothers
An Inspector Calls

Book tickets</td></tr>
<tr><td></td><td>b</td><td></td><td>- To define the formatting of a website…
- To change the formatting depending on device
- To give a consistent look to every page
- To set the formatting {sensible example of part of site}
(1 per -, max 1)</td><td>1
(AO1.1)</td><td></td></tr>
</table>

	c		- `priceText` set to midweek special message on Tuesday
			- and Wednesday
			- `priceText` set to normal message on all other days
			- The HTML of prices changed.
			
			Award full marks if circumvented priceText and changed the HTML straight away.
			
			(1 per - , max 4)
				4
				
				(AO3.2)
					`var date = new Date();`
					`var dayCode = date.getDay(); //0 is Sunday, 1 Monday, 2 Tuesday etc`
					`var priceText="";`
					
					`if(dayCode==2 || dayCode==3)`
					`{`
					`  priceText="Midweek Special – tickets £15 tonight";`
					`}`
					`else`
					`{`
					`  priceText="Tickets £20 tonight";`
					`}`
					
					`document.getElementById("prices").innerHTML= priceText;`
					
					May have used else if instead of or
					{} are optional as single line statements
					Last part may be two lines
					`foo = document.getElementById("prices")`
					`foo.innerHTML= priceText;`

	d		- CUSTOMER… - …Details about the customers(making the booking) - BOOKING… - …Stores a reference to customer unique ID and production unique ID. - PRODUCTION… - …Details of the productions (being booked) - PAYMENTDETAILS… - …Details of payment method used (to make the booking) 1 Mark for each table name (max 1) 1 mark for each description (max 1) Total (max 2)	2 (AO2.2)	

9			<table><tr><th>A</th><th>B</th><th>C</th><th>Q</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> First 4 rows correct 1 mark Last 4 rows correct 1 mark	2 (AO2.2)	

Question	Assessment Objectives							Total
	AO1.1	AO1.2	AO2.1	AO2.2	AO3.1	AO3.2	AO3.3	
1a	4							4
1b			2					2
1c	1							1
1d	3							3
2a			3					3
2b*m*		1						1
2c*m*			2					2
2d*m*		3						3
3*	2	2	2				3	9
4a	1							1
4b				2				2
4c					3			3
4d				2				2
5*	2	2	2				3	9
6a		2						2
6b						5		5
7a			3					3
7b		3						3
8a						3		3
8b	1							1
8c						4		4
8d				2				2
9*m*				2				2
	14	13	14	8	3	12	6	70

*** = extended response**
***m* = mathematical content**

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