



GCSE MARKING SCHEME

SUMMER 2019

**GCSE (NEW)
COMPUTER SCIENCE - COMPONENT 1
C500U10-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2019 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

WJEC GCSE COMPUTER SCIENCE (NEW)

SUMMER 2019 MARK SCHEME

COMPONENT 1 - UNDERSTANDING COMPUTER SCIENCE

Guidance for examiners

Positive marking

It should be remembered that learners are writing under examination conditions and credit should be given for what the learner writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

For questions that are objective or points-based the mark scheme should be applied precisely. Marks should be awarded as indicated and no further subdivision made.

For band marked questions mark schemes are in two parts.

Part 1 is advice on the indicative content that suggests the range of computer science concepts, theory, issues and arguments which may be included in the learner's answers. These can be used to assess the quality of the learner's response.

Part 2 is an assessment grid advising bands and associated marks that should be given to responses which demonstrate the qualities needed in AO1, AO2 and AO3. Where a response is not credit worthy or not attempted it is indicated on the grid as mark band zero.

Banded mark schemes

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks.

Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. Once the annotation is complete, the mark scheme can be applied.

This is done as a two stage process.

Stage 1 – Deciding on the band

When deciding on a band, the answer should be viewed holistically. Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content. Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

Stage 2 – Deciding on the mark

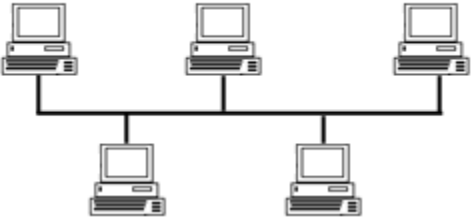
Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

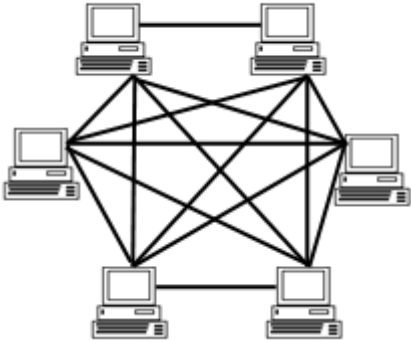
When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is also provided for banded mark schemes. Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Q	Answer	Marks	AO1	AO2	AO3	Total																														
1	<p>One mark for each of the following :</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>No</th> <th>Unit</th> <th>=</th> <th>No</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>bits</td> <td>=</td> <td>1</td> <td>nybble</td> </tr> <tr> <td>8</td> <td>bits</td> <td>=</td> <td>1</td> <td>byte</td> </tr> <tr> <td>1024</td> <td>bytes</td> <td>=</td> <td>1</td> <td>kilobyte</td> </tr> <tr> <td>1024</td> <td>kilobyte</td> <td>=</td> <td>1</td> <td>megabyte</td> </tr> <tr> <td>1024</td> <td>megabytes</td> <td>=</td> <td>1</td> <td>gigabyte</td> </tr> </tbody> </table> <p>Accept SI terminology</p>	No	Unit	=	No	Unit	4	bits	=	1	nybble	8	bits	=	1	byte	1024	bytes	=	1	kilobyte	1024	kilobyte	=	1	megabyte	1024	megabytes	=	1	gigabyte	1 1 1 1 1	a a a a a			5
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2a	<p>One mark for each of the following up to a maximum of two:</p> <ul style="list-style-type: none"> RAM is used to store currently running programs / data. The data in each store location can be changed. RAM is temporary / volatile – data is lost when the power is switched off. 	2	b			2																														
2b	<p>One mark for each of the following up to a maximum of two:</p> <ul style="list-style-type: none"> ROM is non-volatile – data is not lost when the power is switched off ROM is used for the permanent storage of data. The data in each store location cannot be changed. 	2	b			2																														
2c	<p>One mark for each of the following up to a maximum of two:</p> <ul style="list-style-type: none"> RAM Cache memory is used for the storage of frequently accessed data and instructions. It consists of a small number of store locations that can be accessed very quickly by the CPU; Cache memory is volatile – this means that data is lost when the power is switched off. 	2	b			2																														

Q	Answer	Marks	AO1	AO2	AO3	Total																														
3a	<table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>$A \cdot B$</th> <th>\bar{A}</th> <th>$(A \cdot B) + \bar{A}$</th> <th>$B \cdot [(A \cdot B) + \bar{A}]$</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>One mark for each of the following correct columns:</p> <ul style="list-style-type: none"> • $A \cdot B$ • \bar{A} • $(A \cdot B) + \bar{A}$ • $B \cdot ((A \cdot B) + \bar{A})$ 	A	B	$A \cdot B$	\bar{A}	$(A \cdot B) + \bar{A}$	$B \cdot [(A \cdot B) + \bar{A}]$	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	1	1	0	1 1 1 1		a a a a		4
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3bi	AND \cdot	1		b		1																														
3bii	XOR \oplus	1		b		1																														
4	<p>One mark for naming a suitable secondary storage device:</p> <ul style="list-style-type: none"> • (External) hard drive • Magnetic tape drive <p>DO NOT ACCEPT</p> <ul style="list-style-type: none"> • Flash drive • CD/DVD/Blu-ray disc <p>One mark for each correct comparison between the chosen secondary storage devices:</p> <ul style="list-style-type: none"> • Durability: Magnetic tapes are more durable • Portability: Both devices are portable • Speed: External hard drive has a faster disk access speed 	2 1 1 1		b b b b		5																														

Q	Answer	Marks	AO1	AO2	AO3	Total
5a	One mark for each of the following: <ul style="list-style-type: none"> • A network consists of a number of computer systems connected together. • A LAN is a network in which the computer systems are all located relatively close to each other, for example, in the same building or on the same site, such as a school. • A WAN is a network, in which the computers systems are all located relatively distant from each other, for example, in different buildings all over the country or in different countries. 	3	b			3
5bi	<p style="text-align: center;">Bus Topology</p>  <p>One mark for any one of the following:</p> <ul style="list-style-type: none"> • Easy to implement and add more computer systems to the network • Quick to set up – well suited for temporary networks • Cost-effective – less cabling <p>One mark for any one of the following:</p> <ul style="list-style-type: none"> • It is difficult to troubleshoot the bus • Limited cable length and number of stations – performance degrades as additional computers are added • If there is a problem with the main cable or connection, the entire network goes down • Low security – all computers on the bus can see all data transmissions • Proper termination is required • Data collisions are more likely, which causes the network to slow down. A collision is when two computers try to send a packet at the same time 	1 1 1	a b b			3

Q	Answer	Marks	AO1	AO2	AO3	Total
5bii	<p style="text-align: center;">Mesh Topology</p>  <p>One mark for any one of the following:</p> <ul style="list-style-type: none"> • Data can be transmitted from different devices simultaneously. This topology can withstand high traffic • Even if one of the components fails there is always an alternative present. So data transfer doesn't get affected • Expansion and modification in topology can be done without disrupting other nodes. <p>One mark for any one of the following:</p> <ul style="list-style-type: none"> • There are high chances of redundancy in many of the network connections • Overall cost of this network is high as compared to other network topologies • Set-up and maintenance of this topology is very difficult. including administration of the network. 	1	a			3
		1	b			
		1	b			

Q	Answer	Marks	AO1	AO2	AO3	Total															
6a	<p>One mark for each of the following rows:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Destination</th> <th>Lowest Cost</th> <th>Route</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>5</td> <td>A > C > B</td> </tr> <tr> <td>C</td> <td>2</td> <td>A > C</td> </tr> <tr> <td>D</td> <td>6</td> <td>A > C > D</td> </tr> <tr> <td>E</td> <td>10</td> <td>A > C > D > E</td> </tr> </tbody> </table>	Destination	Lowest Cost	Route	B	5	A > C > B	C	2	A > C	D	6	A > C > D	E	10	A > C > D > E	1 1 1 1		b b b b		4
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6b	<p>One mark for a correct advantage and one mark for a correct disadvantage:</p> <p>Advantage</p> <ul style="list-style-type: none"> It is reliable Once the connection is established it is fast and generally error free. <p>Disadvantage</p> <ul style="list-style-type: none"> It takes time to establish the connection. Should anywhere on the route fail then the connection will be broken. More susceptible to interception 	1 1 1 1 1	b b b b b			2															
7ai	01110000 ₂	1		a		1															
7aii	91 ₁₀	1		a		1															
7bi	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> Workings 57₁₆ 	2		a		2															
7bii	<p>One mark for each of the following up to a maximum of two:</p> <ul style="list-style-type: none"> Used as a shorthand for binary Less error prone Used as binary numbers can be quickly converted into hexadecimal numbers that are more convenient for people to use. 	2	b			2															

Q	Answer	Marks	AO1	AO2	AO3	Total
7c	One mark for each of the following: <ul style="list-style-type: none"> $\begin{array}{r} 11010010_2 \\ 11111100_2 \\ \hline 111001110_2 \end{array}$ Identification that number too big to be stored in an 8 bit register / 9th bit cannot be stored This is called overflow 	1 1 1		a b b		3
8a	One mark for each of the following: <ul style="list-style-type: none"> Character sets allow for data exchange between computer systems A character set is a table that maps a character with a unique binary number. 	1 1	b b			2
8b	One mark for each of the following: <ul style="list-style-type: none"> ASCII Unicode 	1 1	a a			2
9a	One mark for each of the following steps: $P \cdot Q + P \cdot \bar{Q}$ $P \cdot (Q + \bar{Q})$ $P \cdot 1$ P	1 1 1		a a a		3
9b	$X + \bar{X} \cdot Y$ $X \cdot 1 + \bar{X} \cdot Y$ $X \cdot (1 + Y) + \bar{X} \cdot Y$ $X + X \cdot Y + \bar{X} \cdot Y$ $X + Y \cdot (X \cdot \bar{X})$ $X + Y$ Other simplifications accepted	1 1 1 1 1		a a a a a		5
10ai	One mark for each of the following: <ul style="list-style-type: none"> $20 \times 8 = 160$ bits $160 / 8 = 20$ <u>bytes</u> 	1 1		a b		2
10aii	$20 \times 8 \times 8 = 1,280$ <u>bits</u>	1		b		1
10aiii	256 colours	1		b		1

Q	Answer	Marks	AO1	AO2	AO3	Total																																			
10bi	<table border="1"> <thead> <tr> <th>File</th> <th>Size Before Compression</th> <th>Compression Ratio</th> <th>Size After Compression</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>195 KB</td> <td>15 : 3</td> <td>39 KB</td> </tr> <tr> <td>B</td> <td>900 KB</td> <td>30 : 1</td> <td>30 KB</td> </tr> <tr> <td>C</td> <td>180 KB</td> <td>18 : 2</td> <td>20 KB</td> </tr> </tbody> </table>	File	Size Before Compression	Compression Ratio	Size After Compression	A	195 KB	15 : 3	39 KB	B	900 KB	30 : 1	30 KB	C	180 KB	18 : 2	20 KB	1 1 1		b b b		3																			
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11	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> Two-dimensional array <table border="1"> <thead> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <th>Jeffrey</th> <td>12.3</td> <td>13.4</td> <td>11.5</td> <td>12.5</td> <td>12.8</td> <td>13.0</td> </tr> <tr> <th>Ahmed</th> <td>14.1</td> <td>13.5</td> <td>13.1</td> <td>13.2</td> <td>12.9</td> <td>13.0</td> </tr> <tr> <th>Moira</th> <td>13.0</td> <td>12.9</td> <td>12.8</td> <td>13.1</td> <td>12.6</td> <td>12.9</td> </tr> <tr> <th>...</th> <td>...</td> <td>...</td> <td>...</td> <td>...</td> <td>...</td> <td>...</td> </tr> </tbody> </table> <p>One mark for (n) x 6 array One mark for indicating data type (real / float data type or sample data that is real date type)</p>		1	2	3	4	5	6	Jeffrey	12.3	13.4	11.5	12.5	12.8	13.0	Ahmed	14.1	13.5	13.1	13.2	12.9	13.0	Moira	13.0	12.9	12.8	13.1	12.6	12.9	1 2		b b		3
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13a(i)	Lexical analysis	1		b		4																																			
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(iii)	Code generation	1		b																																					
(iv)	Code optimisation	1		b																																					

Q	Answer	Marks	AO1	AO2	AO3	Total
13b	One mark for each of the following: <ul style="list-style-type: none"> Loop doesn't follow the correct syntax <code>if i = 1 to 5</code> should read <code>for i = 1 to 5</code> 	2		b		2
13c	<ul style="list-style-type: none"> Change Line 9 to <code>Total = Total + Number</code> and remove Line 12 	1		b		1
14	<p>One mark for each of the following up to a maximum of 3:</p> <p>Indicative Content</p> <ul style="list-style-type: none"> The increase in delivery lorries on the road has caused increased congestion and increases in carbon emissions. Computer Science is supposed to lead to a paperless society but more and more paper seems to be consumed affecting rainforests and influencing global warming. Old computer equipment needs to be disposed of correctly which is expensive. Dumping old computers etc on landfill sites can cause pollution of toxic substances into the water supply and lead to health problems. Computer equipment generates heat so many organisations install air conditioning systems leading to increased carbon emissions. Many computers are left on standby, wasting electricity unnecessarily and increasing carbon emissions. Mining for rare earth elements causes pollution Global assembly lines 	3	b			3

Q	Answer	Marks	AO1	AO2	AO3	Total
15	<p>Indicative content</p> <p>User interface</p> <ul style="list-style-type: none"> • allows copying/deleting/moving/sorting/searching of file or folders • allows access to system settings such as hardware • provides a command line interface • provides a graphical user interface (Windows, Icons, Menus, Pointers) • provides user with errors/help messages • allows customisation of interface, e.g. change desktop background/layout • allows user to switch between tasks (programs/windows) <p>Input/output devices</p> <ul style="list-style-type: none"> • An input device allows data, such as text, images, video or sound, to be entered into a computer system. <ul style="list-style-type: none"> ○ Graphics tablet ○ Mouse ○ Keyboard ○ Microphone ○ Scanner • There are many outputs created by a computer system. These include printed documents, on-screen data and sound. <ul style="list-style-type: none"> ○ Speakers ○ Monitor ○ Printer ○ Projector 	10	b			10

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