



GCSE MARKING SCHEME

SUMMER 2018

**COMPUTER SCIENCE - COMPONENT 1
C500U10-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2018 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.

COMPONENT 1 - UNDERSTANDING COMPUTER SCIENCE

MARK SCHEME

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												
1a	<p>One mark for each of the following:</p> <table border="1"> <thead> <tr> <th>STATEMENT</th> <th>TRUE</th> <th>FALSE</th> </tr> </thead> <tbody> <tr> <td>Natural sound is in digital form. This is sampled and converted into analogue form to be stored by computer systems.</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input checked="" type="checkbox"/></td> </tr> <tr> <td>A sound sample rate of 16KHz means the wave is sampled 160,000 times a second.</td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input checked="" type="checkbox"/></td> </tr> <tr> <td>The lower the sampling rate, the better the quality of the sound file.</td> <td style="text-align: center;">5 <input type="checkbox"/></td> <td style="text-align: center;">6 <input checked="" type="checkbox"/></td> </tr> </tbody> </table>	STATEMENT	TRUE	FALSE	Natural sound is in digital form. This is sampled and converted into analogue form to be stored by computer systems.	1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	A sound sample rate of 16KHz means the wave is sampled 160,000 times a second.	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	The lower the sampling rate, the better the quality of the sound file.	5 <input type="checkbox"/>	6 <input checked="" type="checkbox"/>	1 1 1	b b b			3
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1b	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> A set of data that describes and gives information about other data. <i>Accept additional information about the file</i> <p>For example:</p> <ul style="list-style-type: none"> Date Created / Year – the date the graphic was taken Location – the location where the graphic was taken Size – the original size of the file Dimensions <p><i>Accept any other reasonable example of metadata</i></p>	1 1	a a			2												
1c	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> When you convert a file to a lossy format you discard some of the data / lose quality Lossless conversion doesn't recover the quality because the data lost during lossy compression can't be recovered The resultant file is larger than the lossy compressed file. 	3		b		3												
1d	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> 10 x 300 3,000 (bytes) Answer: 3 KB <p>Accepted not expected 2.9KB (divided by 1024)</p>	1 1 1		a a a		3												

Q	Answer	Marks	AO1	AO2	AO3	Total
2di	<p>One mark for each of the following up to a maximum of 6:</p> <p>Clock speed</p> <ul style="list-style-type: none"> • CPU 2 has a faster clock speed than CPU 1. • CPU 2 will be able to run the FDE cycle faster than CPU 1. • CPU 2 can process more instructions than CPU 1. <p>Number of cores</p> <ul style="list-style-type: none"> • CPU 1 can process more instructions at the same time. • In theory, CPU 1 can process instructions twice as fast as CPU 2. • Performance may be affected where one core is waiting on the result of another and therefore cannot carry out any more instructions, leading to the performance of CPU 1 being no better than CPU 2. <p>Cache size</p> <ul style="list-style-type: none"> • CPU 2 can store more data in its cache memory than CPU 1. • More cache improves the performance as it can provide instructions and data to the CPU at a much faster rate (than other system memory such as RAM). <p>Accepted but not expected: CPU 2 will allow more instructions that are repeatedly used by the CPU to be stored, and therefore has a better hit rate than CPU 1 (increasing performance as a result).</p>	6		b		6

Q	Answer	Marks	AO1	AO2	AO3	Total
2dii	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> • Defragmentation <ul style="list-style-type: none"> ○ is the process where files are physically re-arranged on disk so that they are no longer fragmented and the parts of each file are stored together / improving access speed. • Compression <ul style="list-style-type: none"> ○ software reduces file sizes using less space • Task management <ul style="list-style-type: none"> ○ can see how much disk % a given program is using, can shut it down if dominating. • Disk scanning and repair <ul style="list-style-type: none"> ○ fixes problems on disk. • Anti-virus software <ul style="list-style-type: none"> ○ to scan for viruses which could be causing issues with the disc access speed / damaging data • Backup <ul style="list-style-type: none"> ○ software allows users to archive files and delete files on the hard disk to free up space 	4		b		4
3a	<p>One mark for each of the following up to a maximum of two:</p> <ul style="list-style-type: none"> • An embedded system is the use of a computer system built into a machine to provide a means of control. • An embedded system uses a combination of hardware and software. • Embedded systems performs a specific task which is pre-programmed (in firmware). <p>Accept an example where there's a clear description of hardware and software performing a specific task e.g. A washing machine has a control chip that manages the different program cycles.</p>	2	b			2
3b	<ul style="list-style-type: none"> • Correct B OR C / C OR B relationship • Correct A AND B, A AND C relationship – must be both • Correct use of brackets or order of precedence if brackets not used <p>Correct examples</p> <ul style="list-style-type: none"> • $A.(B + C)$ • $(C + B).A$ • $(A.C) + (A.B)$ • $A.C + A.B$ 	1 1 1		b b b		3
3c	<p>0101001001111000₂</p> <p>Multiplying by 8₁₀ or 2³</p>	1 1		a b		2

Q	Answer	Marks	AO1	AO2	AO3	Total
4a	<p style="text-align: center;">SMTP 1 ✓</p> <p style="text-align: center;">FTP 2</p> <p style="text-align: center;">POP3 3</p> <p style="text-align: center;">IMAP 4</p>	1	a			1
4b	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> • The Ethernet protocol defines standards for network communications used at the physical layer • and corresponding transmission speeds. <p>Or</p> <ul style="list-style-type: none"> • At the data link layer Ethernet protocols describe how network devices can format data for transmission • using frames / packets. 	2	b			2
4c	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> • HTTPS is a secure variant of HTTP (to transport data securely) • HTTPS works together with another protocol, Secure Sockets Layer (SSL), to transport data securely 	2	b			2

Q	Answer	Marks	AO1	AO2	AO3	Total
4d	<p>One mark for each of the following:</p> <p>Physical layer (max 2 marks)</p> <ul style="list-style-type: none"> • The physical layer transmits the raw data. • It consists of hardware such as switches and routers. • The layer deals with all aspects of setting up and maintaining a link between the communicating computers. <p>Transport layer (max 2 marks)</p> <ul style="list-style-type: none"> • The transport layer ensures that data is transferred from one point to another reliably and without errors. • The transport layer is responsible for making sure that data is sent and received in the correct order. • The transport layer is implemented in the sending and receiving computers but not in the routers on the path between them. • It acts as an interface between the communicating computers and the network. <p>Application layer</p> <ul style="list-style-type: none"> • The application layer provides interfaces to the software to allow it to use the network. • Examples of software include email, file transfer protocol (FTP) and the World Wide Web (WWW). 	2	b			6
		2	b			
		2	b			

Q	Answer	Marks	AO1	AO2	AO3	Total
5	<p>One mark for each of the following:</p> <p>Runtime/ execution</p> <ul style="list-style-type: none"> • An error that only occurs when the program is running and is difficult to foresee before a program is compiled and run • Example: Program requests more memory when none is available, so the program crashes <p>Linking</p> <ul style="list-style-type: none"> • An error that occurs when a programmer calls a function within a program and the correct library has not been linked to that program • Example: When the square root function is used and the library that calculates the square root has not been linked to the program. Calls a variable / function into the program. <p>Rounding</p> <ul style="list-style-type: none"> • Rounding is when a number is approximated to nearest whole number/tenth/hundredth, etc. • Example: 34.5 rounded to nearest whole number is 35, an error of +0.5 	6	b			6
6a	<p>One mark for each of the following up to a maximum of four:</p> <ul style="list-style-type: none"> • Instructions are close to English / easier for people to read / write than a low-level language, • Using a high level language leads to fewer errors • Use of powerful commands that perform quite complex tasks such as MsgBox in Visual Basic or the SORT clause in COBOL • It's quicker to develop code / easier to maintain code (than if it were written in a low-level language) • They are usually available across many platforms / chipsets / operating systems 	4	b			4

Q	Answer	Marks	AO1	AO2	AO3	Total
6b	One mark for each of the following:					6
(i)	<p>Interpreted</p> <ul style="list-style-type: none"> • Description <ul style="list-style-type: none"> ○ In error reporting, the interpreter would encounter the errors and report it to the user immediately and halts further execution of the program. <p>Compiled</p> <ul style="list-style-type: none"> • Description <ul style="list-style-type: none"> ○ The compiler would analyse the entire program, taking note of where errors have occurred, and places this in an error/diagnostic file. 	2		b		
(ii)	<ul style="list-style-type: none"> • Benefit <ul style="list-style-type: none"> ○ Interpreters are easier to use as errors are reported and corrected as execution continues. • Drawback: <ul style="list-style-type: none"> ○ The interpreter would be slower than a compiler as it would translate the same statements within the loop over and over again. • Benefit: <ul style="list-style-type: none"> ○ Compilation requires analysis and the generation of the code only once ○ Compilers can produce much more efficient object code than interpreters thus making the compiled programs to run faster. • Drawback: <ul style="list-style-type: none"> ○ Displaying multiple errors the same time on the whole means compilers tend to be more difficult to use. <p>Don't accept answers that are the reverse of each other e.g. Interpreters are slower than compilers, Compilers are faster than interpreters.</p>	4	b			
7a	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> • Record • As the structure contains more than one data type. 	2		a		2

Q	Answer	Marks	AO1	AO2	AO3	Total															
7b	<p>One mark for each different correctly named check type x 3 One mark for the check itself x 3</p> <p>Surname</p> <ul style="list-style-type: none"> • Presence check: If NULL or empty <p>National Insurance (NI) number</p> <ul style="list-style-type: none"> • Format check: LL000000L • Length check: 9 characters • Presence check: If NULL or empty <p>Job title</p> <ul style="list-style-type: none"> • List: Apprentice, semi-skilled, skilled, supervisor • Presence check: If NULL or empty <p>Week number</p> <ul style="list-style-type: none"> • Type check: Integer / Must be a whole number • Range check: >0 and <53 • Presence check: If NULL or empty <p>Full time</p> <ul style="list-style-type: none"> • Type check: Character • List: Y, N • Presence check: If NULL or empty • Length check: 1 character <p>Hours worked (current week)</p> <ul style="list-style-type: none"> • Type check: Integer / Must be a whole number • Range check: >0 and <41 • Presence check: If NULL or empty <p>Hourly pay rate</p> <ul style="list-style-type: none"> • Type check: Real • Range check: >0.00 and <=15.00 • Presence check: If NULL or empty 	3 3		a b		6															
8a	<p>One mark for each of the following:</p> <table border="1" data-bbox="261 1615 903 1962"> <thead> <tr> <th>Denary</th> <th>Binary</th> <th>Hexadecimal</th> </tr> </thead> <tbody> <tr> <td>41₁₀</td> <td>00101001₂</td> <td>29₁₆</td> </tr> <tr> <td>58₁₀</td> <td>00111010₂</td> <td>3A₁₆</td> </tr> <tr> <td>175₁₀</td> <td>10101111₂</td> <td>AF₁₆</td> </tr> <tr> <td>253₁₀</td> <td>11111101₂</td> <td>FD₁₆</td> </tr> </tbody> </table>	Denary	Binary	Hexadecimal	41 ₁₀	00101001 ₂	29 ₁₆	58 ₁₀	00111010 ₂	3A ₁₆	175 ₁₀	10101111 ₂	AF ₁₆	253 ₁₀	11111101 ₂	FD ₁₆	1 1 1		a		3
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10ai	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> SQL injection is a technique where malicious users can inject SQL commands into an SQL statement, via web page input. Injected SQL commands can alter SQL statements and compromise the security of information held in a database. 	2	b			2																														
10aia	<p>One mark for each of the following:</p> <ul style="list-style-type: none"> IP address spoofing involves an attacker changing the IP address of a legitimate host so that a visitor who types in the URL of a legitimate site is taken to a fraudulent or spoofed web page. The attacker can then use the hoax page to steal sensitive data, such as a credit card number, or install malware. 	2	b			2																														

Q	Answer	Marks	AO1	AO2	AO3	Total
10b	<p>Indicative content</p> <p>Footprinting.</p> <ul style="list-style-type: none"> • Footprinting is the first step in the evaluation of the security of any computer system. • It involves gathering all available information about the computer system or network and the devices that are attached to it. • Footprinting should enable a penetration tester to discover how much detail a potential attacker could find out about a system • and allow an organisation to limit the technical information about its systems that is publicly available. <p>Ethical hacking</p> <ul style="list-style-type: none"> • Ethical hacking is carried out with the permission of the system owner to cover all computer attack techniques. • An ethical hacker attempts to bypass system security and search for any weak points that could be exploited by malicious hackers. • This information is then used by the system owner to improve system security. <p>Penetration testing</p> <ul style="list-style-type: none"> • Penetration testing is a sub set of ethical hacking that deals with the process of testing a computer system, or network to find vulnerabilities that an attacker could exploit. • The tests can be automated with software applications or they can be performed manually. <p>Penetration test strategies include;</p> <ul style="list-style-type: none"> • Targeted testing, testing carried out by the organization's IT team and the penetration testing team working together. • External testing, to find out if an outside attacker can get in and how far they can get in once they have gained access. • Internal testing, to estimate how much damage a dissatisfied employee could cause. • Blind testing, to simulate the actions and procedures of a real attacker by severely limiting the information given to the team performing the test. 	8	b			8

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