GCSE MARKING SCHEME

AUTUMN 2020

COMPUTER SCIENCE - COMPONENT 1
C500U10-1

INTRODUCTION

This marking scheme was used by WJEC for the 2020 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.

GCSE COMPUTER SCIENCE

COMPONENT 1 - UNDERSTANDING COMPUTER SCIENCE

AUTUMN 2020 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
1.	Award one mark for each of the following: **Data Type** / **Example** Integer – 3 Boolean – TRUE Real – 3.2 Character – C String – Cat	1 1 1 1 1	1a 1a 1a 1a 1a			5
2. (a)	Award one mark for each of the following: • Laser beams are projected onto a CD/DVD or Blu-ray disk and if light is reflected back, then data is read as a 1 and if light is not reflected back, data is read as a 0. **Optical** • This technology is used in hard disks and tapes. Data is stored on a medium by writing data using a write-head. Data can then be read by the read-head. **- Magnetic** • Used in storage media such as flash memory sticks. The technology does not have any moving parts, such as a read-head in magnetic storage. **- Solid State**	3		1b		3
(b)	Award one mark for each of the following: • Durability – Flash memory sticks are more durable • Portability – Both devices are portable / Flash memory sticks are smaller, so easier to move • Speed - Flash memory sticks are faster	1 1 1	1b 1b 1b			3
3. (a) (i)	The **motherboard** is the main circuit board of the computer.	1		1b		1
(ii)	The **sound card** will convert analogue input signals into digital data and reverse this process for output.	1		1b		1
(iii)	The **RAM** will be used for the temporary storage of currently running programs and data.	1		1b		1
(iv)	The **1 MB cache** memory is used for the temporary storage of frequently accessed data and instructions.	1		1b		1
(b)	Award one mark for each of the following: • 4096 (4,000)MB should be accepted. • 0.004096 (0.004) TB	1 1		1a 1a		2

Q	Answer	Marks	AO1	AO2	AO3	Total
(c)	Award one mark for each of the following: • Suitable upgrade x 2 • Correctly stated impact x 2 **Example** Upgrade: Increase processor to quad-core Impact: Can process up to four instruction simultaneously instead of two Upgrade: Increase RAM Impact: Can store run more programs concurrently	 2 2		 1b 1b		4
(d)	Award one mark for each of the following: **Integrated GPU (MAX 2)** • An integrated GPU is on the same chip as the central processing unit (CPU) • An integrated GPU uses the computer's RAM • An integrated unit is cheaper than installing a dedicated GPU • It generates less heat and uses less power. • They are perfect for general graphics processing such as watching or editing videos and word processing. **Dedicated GPU (MAX 2)** • A dedicated GPU has its own video memory • This frees up RAM. • Is separate from the CPU • Dedicated cards provide the best visual experience • They are used by people such as professional graphic designers and serious gamers • They use more power and require a good cooling system • They take the load from the CPU because the dedicated graphics card does all the graphics processing or graphics-related tasks • GPU memory is faster than the computer memory or normal RAM	 2 2	 1b 1b			4

Q	Answer	Marks	AO1	AO2	AO3	Total
4. (a) (i)	<table><tr><th>A</th><th>NOT A</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr></table> Award one mark for each of the following: • Correct A column • Correct NOT A column	 1 1	 1a 1a			2
4. (a) (ii)	<table><tr><th>A</th><th>B</th><th>A XOR B</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table> Award one mark for each of the following: • Correct A and B columns • Correct A XOR B column	 1 1	 1a 1a			2
(b)	Award one mark for each of the following: • Suitable Boolean expression • Correct A, B (and C) columns or equivalent • Correct use of OR operator • Correct use of AND operator • Correct final column for Boolean expression	 1 1 1 1 1		 1b 1b 1b 1b 1b		5
5. (a) (i)	Award one mark for each correct byte: $6B_{16}$ $5D_{16}$	 1 1		 1a 1a		2
(ii)	190_{10}	2		1a		2
(b) (i)	Award one mark for each of the following: • 00010110 • Divide by 4	 1 1		 1a 1b		2
(ii)	Award one mark for each of the following: • ~~1~~01100000 / multiply by 4 • Overflow	 1 1		 1a 1b		2

Q	Answer	Marks	AO1	AO2	AO3	Total
6. (a)	Award one mark for each of the following: • Graphical User Interface (GUI) • Command line (CLI)	 1 1		 1a 1a		2
(b) (i)	Award one mark for each of the following: • A touch screen is very intuitive • Easy to use as the user simply touches what they see on the display • Save space as no keyboard or mouse is required. • Touch monitors can even be mounted on the wall. • Touching a visual display of choices requires little thinking and is a form of direct manipulation that is easy to learn. • Touch screens are the fastest pointing devices. • Touch screens have easier hand eye coordination than mice or keyboards. • No extra work space is required as with other pointing devices. • Touch screens are durable in public access and in high volume usage	3	1b			3
(ii)	Award one mark for each of the following: • Difficult for people with accessibility issues, e.g no feedback, disability • Can be easily damaged/scratched • Damaged/scratched screen prevent the interface from functioning as it should • Dirty screens difficult to read • Users must be within arm's reach of the display • It is difficult to select small items • User's hand may obscure the screen • Screens need to be installed at a lower position and tilted to reduce arm fatigue • Some reduction in image brightness may occur • They cost more than alternative devices	2	1b			2

Q	Answer	Marks	AO1	AO2	AO3	Total
7.	Award one mark for each of the following: • $P(0 + R) + \overline{P}.R$ • $P.0 + P.R + \overline{P}.R$ • $P.R + \overline{P}.R$ • $R.(P + \overline{P})$ • $R.(1)$ • R • Accept alternative methods of simplification • **DO NOT** accept truth tables Award full marks if correct answer only given	 1 1 1 1 1		 1a 1a 1a 1a 1a		5
8.	**Indicative content** • Each website has its own unique IP address • A DNS server will contain a list of domain names • A DNS server will contain a list of corresponding IP addresses • A web site address is typed into the address bar of a browser • The browser checks the local (cached) host file to check if it already holds the IP address • The local (your domain) DNS server is queried for the IP address • If the local DNS server does not hold the IP address then the query is passed to another DNS server at a higher level until the IP address is resolved • The address is passed on to DNS severs lower in the hierarchy • When the full address has been resolved, the IP address is then passed to your browser • The browser then connects to the IP address of the server and downloads the web site.	6	1b			6

Q	Answer	Marks	AO1	AO2	AO3	Total

Band	AO1 (Max 6 marks)
2	**4-6 marks** The candidate has: • shown clear understanding of the requirements of the question and a clear knowledge of the indicative content. Clear knowledge is defined as a response that provides four to six relevant detailed points from the indicative content • addressed the question appropriately explaining how a domain name is used to access a web site including the role of Domain Name System (DNS) servers with minimal repetition and no irrelevant material • used appropriate technical terminology referring to the indicative content accurately.
1	**1-3 marks** The candidate has: • attempted to address the question and has demonstrated some knowledge of the topic specified in the indicative content. Some knowledge is defined as a response that provides one to three relevant points from the indicative content • addressed the question explaining how a domain name is used to access a web site including the role of Domain Name System (DNS) servers • used limited technical terminology referring to the indicative content.
0	**0 marks** Response not credit worthy or not attempted.

Q	Answer	Marks	AO1	AO2	AO3	Total
9. (a)	Award one mark for each of the following: • Compilers convert each line of source code into machine code, and executes it as each line of code is run **- False** • At the lexical analysis stage of compilation, comments and unneeded spaces are removed **- True** • Tokens are checked to see if they match the spelling and grammar expected, using standard language definitions during the code generation stage of compilation. **- False** • At semantic analysis stage of compilation, variables are checked to ensure that they have been properly declared and used. **- True** • Compilers translate a program written in one language into an equivalent program written in a different language. **- False**	1 1 1 1 1		1b 1b 1b 1b 1b		5
(b)	Award one mark for each of the following: • An assembler is a program which converts the low level assembly programming language into machine code. • The assembler does this by converting the one-word assembly instructions into an opcode. • It also allocates memory to variables, often resulting in an operand.	3	1b			3
(c)	Award one mark for each of the following: **Syntax** • An error that occurs when a command does not follow the expected syntax of the language, e.g. when a keyword is incorrectly spelt • Incorrect: IF A ADN B Then • Correct: IF A AND B Then **Logical** • An error that causes a program to output an incorrect answer (that does not necessarily crash the program) • An algorithm that calculates a person's age from their date of birth, but ends up giving negative numbers	2 2	1b 1b			4

Q	Answer	Marks	AO1	AO2	AO3	Total
10. (a)	Award one mark for each of the following: • A backup is a copy of data that can be used if the original data is lost. • Backups of all data should be made regularly as the older the backed up data becomes, the less likely it is to match any current data stored on a computer system. • A typical backup policy would require that three different backups be kept at any given time • with one of these being stored off-site. • The oldest backup copy would be named the grandfather, the second oldest backup being named the father and the most recent backup being called the son. • When a new backup is made, the oldest backup, the grandfather is overwritten and becomes the son backup, with the original son becoming the father and the father becoming the grandfather. • This backup policy is called the grandfather-father-son method.	4	1b			4
(b)	Award one mark for each of the following: • When the data stored is no longer in regular use • But may be required sometime in the future • It is held for security, legal or historical reasons. • The process of archiving data frees up resources on the main computer system • The process of archiving data allows faster access to data that is in use.	2	1b			2

Q	Answer	Marks	AO1	AO2	AO3	Total
11.	Award one mark for each of the following: **High Level (MAX 3)** • It is similar to a natural human language, such as English. • Some programmers prefer to use high level programming languages, as they are easier to understand, learn and program. • Their commands are similar to natural languages like English and identifiers can be long and meaningful. • High level programming languages also allow the use of powerful commands that perform quite complex tasks such as MsgBox in Visual Basic or the SORT clause in COBOL. • Lines of code in a high level language corresponds to several lines of code in a low language • High level languages are used when the execution speed is not the most critical factor o e.g. in common productivity applications, such as a word processor, or spreadsheet. • Most modern applications such as commercial database packages, operating systems, e-commerce software and social media apps are developed using a high level programming language. **Low Level (MAX 3)** • Programming in a low level language, such as assembly code requires knowledge of the internal structure of the CPU and is therefore very specialised. • The program statements are written for a particular type of CPU and make direct reference to specific internal registers • Assembly code uses mnemonics and is converted to machine code for execution using an assembler. • Source code produced in a low level language, is not portable, but it can be very efficient and the programs can be made to run faster than programs produced using a high level language. • Although uncommon, some programmers may wish to program directly in machine code or use assembly code. • This is primarily done when programming device drivers or embedded systems, where fast execution speeds are critical. • Professional game developers may need to use console specific development software, which is likely to include low level features for optimum performance.	3 3	1b 1b			6

Q	Answer	Marks	AO1	AO2	AO3	Total
12.	Award one mark for each of the following (MAX 3 for naming): • Manages peripherals such as input and output devices o Communicates with and sends data output to a printer/monitor/other valid output device o Communicates with and receives data input to a keyboard/mouse/other valid input device • Manages printing using spooling o Data is stored on hard disc/in memory/stored in a queue o Document is printed when printer is free/in correct order o Benefit of spooling – user can carry on working/log off when waiting for job to print • Manages backing store o Ensures that data is stored and can be retrieved correctly from any disk drive o Creates and maintains Filing system such as FAT or NTFS (accepted but not expected) o Organise files in a hierarchical directory structure. • Manages memory (RAM) o Ensures that programs/data do not corrupt each other o Ensures that all programs and data including itself is stored in correct memory locations • Manages processes o Ensures that different processes can utilise the CPU and do not interfere with each other or crash o On a multi-tasking O/S ensure that all tasks appear to run simultaneously • Manages security o Allows creation and deletion of user accounts o Allows users to logon and change passwords	6	1b			6

Q	Answer	Marks	AO1	AO2	AO3	Total
13.	**Indicative content** • Initial thoughts – Virus / Worm / Trojan / Spyware / Malware • Viruses o programs that can replicate themselves and be spread from one system to another by attaching themselves to host files. o They are used to modify or corrupt information on a targeted computer system. • Worms o self-replicating programs that identify vulnerabilities in operating systems and enable remote control of the infected computer • Spyware o Installed by opening attachments or downloading infected software. Spyware can be used to collect stored data without the user's knowledge. • Trojans o programs that appears to perform a useful function, but also provides a 'backdoor' that enables data to be stolen **Preventions** • Anti virus o Install Virus protection software, also called anti-virus software o A program that can be loaded into memory when the computer is running o It monitors activity on a computer system for the signs of virus infection o Each virus has its own unique 'signature' that is known to virus protection software and stored in a database o Data stored on a computer system is scanned to see if any of the virus signatures within the database exist on the system. • Use a firewall o A firewall can be a software or hardware security system that controls the incoming and outgoing network traffic o Packets of data are analysed to determine whether they should be allowed through or not. • Update software regularly • Operating systems o New ways to bypass the operating system's built-in security are often	10		1b		10

Q	Answer	Marks	AO1	AO2	AO3	Total
	discovered and can be covered by installing the security patches issued by the operating system manufacturer • Web browsers • Provide staff training on this o Phishing emails o Emails that ask you to confirm personal details are usually fakes o They should be caught by the spam filter, but be suspicious and do not provide any sensitive information • If you suspect you have malware on your computer you will need to download and run a malicious software removal tool that should detect and remove malware not blocked by the anti-virus software • Organisation should have in place Acceptable use policy • Organisation and its staff should be aware of and follow the Computer Misuse Act 1990.					

<table>
<tr><th>Q</th><th>Answer</th><th>Marks</th><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th></tr>
<tr><td></td><td>
<table>
<tr><th>Band</th><th>AO2.1b
(Max 10 marks)</th></tr>
<tr><td>3</td><td>8-10 marks
The candidate has:
• shown clear understanding of the requirements of the question and a clear knowledge of the indicative content. Clear knowledge is defined as a response that provides eight to ten relevant detailed points from the indicative content
• addressed the question appropriately.
• used appropriate technical terminology referring to the indicative content accurately.</td></tr>
<tr><td>2</td><td>4-7 marks
The candidate has:
• shown adequate understanding of the requirements of the question and a satisfactory knowledge of the indicative content. Satisfactory knowledge is defined as a response that provides four to seven points from the indicative content.
• addressed the question appropriately
• used appropriate technical terminology referring to the indicative content.</td></tr>
<tr><td>1</td><td>1-3 marks
The candidate has:
• attempted to address the question but has demonstrated superficial knowledge of the indicative content. Superficial knowledge is defined as a response that provides one to three points from the indicative content.
• used limited technical terminology referring to the indicative content</td></tr>
<tr><td>0</td><td>0 marks
Response not credit worthy or not attempted.</td></tr>
</table>
</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">TOTAL</td><td>100</td><td>52</td><td>48</td><td>0</td><td>100</td></tr>
</table>