



GCSE MARKING SCHEME

SUMMER 2024

**COMPUTER SCIENCE - UNIT 1
3500U10-1**

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCSE COMPUTER SCIENCE
UNIT 1 - UNDERSTANDING COMPUTER SCIENCE
SUMMER 2024 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.

Question	Answer	Marks	AO1	AO2	AO3	Total																				
1	<p>Award one mark for each correct tick for True or False:</p> <table border="1"> <thead> <tr> <th>Topic</th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>Control Unit</td> <td>✓</td> <td></td> </tr> <tr> <td>Program Counter</td> <td></td> <td>✓</td> </tr> <tr> <td>RISC CPU</td> <td>✓</td> <td></td> </tr> <tr> <td>Clock speed</td> <td></td> <td>✓</td> </tr> </tbody> </table>	Topic	True	False	Control Unit	✓		Program Counter		✓	RISC CPU	✓		Clock speed		✓	4	1a			4					
Topic	True	False																								
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2 (a)	<p>Award one mark for each correct tick for hardware.</p> <table border="1"> <thead> <tr> <th>Hub</th> <th>Router</th> <th>Switch</th> <th>Bridge</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>✓</td> <td></td> </tr> </tbody> </table>	Hub	Router	Switch	Bridge				✓	✓					✓					✓		4	1a			8
Hub	Router	Switch	Bridge																							
			✓																							
✓																										
	✓																									
		✓																								
2 (b)	<p>Award one mark for each correct network identified to a maximum of four marks.</p> <ul style="list-style-type: none"> • LAN • WAN • PAN • MAN • VPN • Wireless 	4	1a																							
3 (a)	<p>Award one mark for each sentence correctly completed.</p> <p>(i) During Lexical analysis keywords and identifiers are replaced by tokens.</p> <p>(ii) During Semantic analysis variables are checked to ensure that they are of the correct data type.</p> <p>(iii) A Symbol table is created to hold the addresses of variables and subroutines.</p> <p>(iv) Code Optimisation may be employed to make the program more efficient.</p>	4	1b			8																				

Question	Answer	Marks	AO1	AO2	AO3	Total
3 (b)	<p>Award one mark for each correct error type and one mark for each sensible correction, to a maximum of four marks.</p> <p>(i) Type of error: logical</p> <p>Correction : last line, change + Deducts to - Deducts</p> <p>(ii) Type of error: syntax</p> <p>Correction: penultimate line, 'tax' should be 'Tax'.</p>	4		2a		
4(a)	<p>(i) Award one mark for each correct digit 'F C'</p> <p>(ii) Award one mark for each correct digit '8 A'</p> <p>(iii) Award one mark for each correct digit '93'</p>	6		2b		8
4 (b)	<p>Award one mark for each correct effect.</p> <p>(i) The effect is to multiply by 2 / double the number.</p> <p>(ii) The effect is to divide by 4</p>	2		2a		
5	<p>Award one mark for a correct IDE tool identified and one mark for an associated description, to a maximum of six marks.</p> <p>Tools used to identify / remove errors, may include;</p> <p>Debugger. Used to identify/fix a program error.</p> <p>Trace. Logs variable values and outputs as they change during program execution.</p> <p>Break point. Adds a pause to stop program execution at a pre-selected point.</p> <p>Variable watch. Displays the current value of a selected variable / allows the value to be watched line by line to view changes.</p> <p>Memory inspector. Shows content of memory / how it is being used by the program / identifies problems such as a memory leak.</p> <p>Error diagnostics. Displays information about errors, such as location and type.</p>	6	1b			6

Question	Answer	Marks	AO1	AO2	AO3	Total
6	<p>Award one mark for a relevant utility identified and one mark for an associated description, to a maximum of six marks.</p> <p>Utility software used to help maintain security and integrity of computer data.</p> <p>Virus scanning / Anti-virus. Used to locate and delete viruses / scans and compares files with databases of known viruses.</p> <p>Firewall: checks data packets / examines source address / filters out unexpected packets.</p> <p>Back up. Copies data onto a separate storage device for use if the original data is lost or corrupted.</p> <p>Allow Data recovery tools / version control software / encryption utilities.</p>	6	1b			6
7	<p>Award one mark for a relevant current legislation identified and one mark for an associated description, to a maximum of six marks.</p> <p>Legislation relevant to security and integrity of individuals' data.</p> <p>Data Protection Act / GDPR. Controls what data is collected, why and what it will be used for / any of the six principles</p> <p>Computer Misuse Act. Makes unauthorised access / hacking / data theft / spreading viruses illegal</p> <p>Copyright Act. Makes it a criminal offence to copy work, including digital content, without permission.</p> <p>Regulation of Investigatory Powers Act. (RIPA). Allows certain authorities / ISPs to monitor online activity of suspected criminals.</p> <p>Allow Creative Commons and Freedom of Information Act with relevant description.</p>	6	1b			6

Question	Answer	Marks	AO1	AO2	AO3	Total																			
8 (a)	Award one mark for each correct expression. (i) $(A \cdot B) + C = (A + C) \cdot (B + C)$ (ii) $(A + B) \cdot C = (A \cdot C) + (B \cdot C)$	2		2b		12																			
8 (b)	Award one mark for each correct expression. $A \cdot (A + B) = A$ $A + A \cdot B = A$	2		2b																					
8 (c)	Award one mark for each correct line. Award four marks for correct answer. $A \cdot (A + B) + B \cdot (A + B)$ <ul style="list-style-type: none"> • $A \cdot A + A \cdot B + B \cdot A + B \cdot B$ • $A + A \cdot B + B \cdot A + B$ • $A \cdot (1 + B) + B \cdot (A + 1)$ • $A + B$ 	4		2b																					
8 (d)	Award one mark for each correct row in the table <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>P</th> <th>Q</th> <th>P.Q</th> <th>P + (P . Q)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	P	Q	P.Q	P + (P . Q)		0	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1	4		2b
P	Q	P.Q	P + (P . Q)																						
0	0	0	0																						
0	1	0	0																						
1	0	0	1																						
1	1	1	1																						

Question	Answer	Marks	AO1	AO2	AO3	Total
9 (a)(i)	Award one mark for each correct data type to a maximum of two marks Range – Integer Model - Character	4		2a		10
9 (a) (ii)	Award one mark for each correct validation check to a maximum of two marks Range – Range check / Type check Model - Lookup table / Length check					
9 (b)	Award one mark for correct encryption method and one mark for correct cyphertext. Plaintext = 01010110 Key = <u>11110000</u> Cyphertext = 10100110 Award one mark for correct decryption method and one mark for correct plaintext. Cyphertext = 10100110 Key = <u>11110000</u> Plaintext = 01010110	4		2b		
9 (c)	Award <ul style="list-style-type: none"> • one mark for idea of protection if intercepted during transmission. • one mark for unreadable format / cannot be understood. • one mark for protection of customers' private data such as bank account details, to a maximum of two marks Indicative content The data is encrypted so that if it is intercepted by unauthorised users / hackers during transmission it will be in an unreadable format so it cannot be understood and therefore the customers data will be protected and remain private.	2		2a		

Question	Answer	Marks	AO1	AO2	AO3	Total
10 (a)	<p>Award one mark for a correct characteristic and one mark for an associated description to a maximum of six marks.</p> <ul style="list-style-type: none"> • Low level languages do not resemble natural languages (1) they are made up entirely of bit patterns (1). • Low level languages produce code that is executed faster (1) as it is already in a format the CPU can execute / does not need to be translated (1). • High level languages are easier to understand / learn (1) as commands are more like English / identifiers can be meaningful (1). • High level languages are easier to use (1) leading to fewer errors (1). 	6	1b			10
10 (b)(i)	<p>Award one mark for each correct situation to a maximum of two marks</p> <p>High level languages are used in situations when:</p> <ul style="list-style-type: none"> • Speed of execution is not a critical factor, such as in office applications. • a programmer needs to use complex commands that perform complex tasks. • A programmer wants to make use of standardised library / sub routines. 	2		2b		
10 (b)(ii)	<p>Award one mark for each correct situation to a maximum of two marks</p> <p>Low level languages are used in situations when:</p> <ul style="list-style-type: none"> • a program must execute quickly such as real time applications • a programmer needs to write code that interacts directly with the hardware, such as device drivers • a programmer needs to perform a specific command not available in a HL language. 	2		2b		

Question	Answer	Marks	AO1	AO2	AO3	Total																					
11(a)	<p>Award one mark for each correct column to a maximum of five marks.</p> <table border="1"> <tr> <td>T</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>A</td> <td>12</td> <td>6</td> <td>14</td> <td>2</td> <td>4</td> <td>8</td> </tr> <tr> <td>B</td> <td>1100</td> <td>0110</td> <td>1110</td> <td>0010</td> <td>0100</td> <td>1000</td> </tr> </table>	T	1	2	3	4	5	6	A	12	6	14	2	4	8	B	1100	0110	1110	0010	0100	1000	5		2		10
T	1	2	3	4	5	6																					
A	12	6	14	2	4	8																					
B	1100	0110	1110	0010	0100	1000																					
11(b)	<p>Award one mark for each correct calculation.</p> <p>(i) $4 \times 6 = 24$ bits</p> <p>(ii) $24 / 8 = 3$ bytes</p>	2		2																							
11(c)(i)	<p>Award one mark for correct calculation</p> <p>$4 \times 6 \times 4 = 96$ bits $96 / 8 = 12$ bytes $3 \text{ bytes} \times 4 = 12$ bytes</p> <p>Accept method with carry through error from (b)</p>	1		2																							
11(c)(ii)	<p>Award one mark for improved accuracy / quality and one mark for increased file size.</p> <p>Indicative content.</p> <p>As the sampling rate increases the size of the file used to store the wave data will increase resulting in the sound wave becoming a more accurate representation of the original sound / being of higher quality.</p>	2		2																							

Question	Answer	Marks	AO1	AO2	AO3	Total
12	<p>Band marked.</p> <p>Indicative content</p> <p>Purpose</p> <p>The 5 layer TCP/IP model is used to visualise the different parts of a network and the specific roles carried out by each layer.</p> <p>Splitting the network design into layers simplifies network design and makes it easier to modify and use. Each layer has a purpose and is associated with different protocols.</p> <p>The 5 layers of the model are:</p> <ul style="list-style-type: none"> • Application layer, comprising the group of applications requiring network communications that are used to request connections and generate data. • Transport layer, based on TCP and UDP protocols that are used to establish connections between applications on different hosts. • Network layer based on IP used to create the frames that move across the network and transfer data packets with IP (virtual) addresses. • Data Link layer that transfers frames with physical MAC addresses. • Physical layer that drives the signals on the network, transmitting and receiving data. <p>Functionality</p> <p>Application Layer</p> <ul style="list-style-type: none"> • Defines the interface for application programs with transport layer services. • Handles the communication of the whole data message and provides an interface between the network services and the application programs. • Provides services to the end-users to work over the network, such as file transfer, web browsing, etc. using higher level protocols including HTTP, HTTPS, FTP, SMTP. • Helps in setting up and managing the network connections and checks for the user's program authentication and authorisation for the data. • Performs complex operations such as data translation, encryption and decryption, and data compression. 	12	1b			12

Question	Answer	Marks	AO1	AO2	AO3	Total
	<p>Transport Layer</p> <ul style="list-style-type: none"> • Is responsible for transporting data and setting up communication between the application layer and the lower layers. • Facilitates the end-to-end communication, error-free delivery of the data and flow control by specifying data rates. • Used for process-to-process communication using the port number of the source and the destination. <p>The transport layer provides congestion control using the following protocols:</p> <ul style="list-style-type: none"> • TCP (Transmission Control Protocol). Performs sequencing of data, and flow and error control in data transmission. There is an acknowledgement feature in TCP for the received data. A slow but reliable protocol suitable for important and non-real time data items. • UDP (User Datagram Protocol). It is a connection-less protocol. It does not perform flow and error control in data transmission. There is no acknowledgement feature in UDP for the received data. It is a fast but unreliable protocol, suitable for real-time data items. <p>Network Layer</p> <ul style="list-style-type: none"> • Deals with data in the form of data packets, using logical addressing of the data packets by adding the IP(Internet Protocol) address to it. • Performs routing of data packets using the IP addresses. The data packets can be sent from one network to another using the routers in this layer. A router determines the path the data should take based on network conditions. • Routers manage traffic problems on the network such as the routing of packets to minimise congestion of data. • Also performs the sequencing of the data packets at the receiver's end and defines the various protocols for transmission of data within the same or different network. <p>Data Link Layer</p> <ul style="list-style-type: none"> • Carries out data framing adding header information to the data packets for the successful delivery to correct destinations, using physical addressing of the data packets by adding the source and the destination address. • Controls the delivery of frames within the same network and the flow and error control of the data frames. Errors in transmission and faulty data frames can be detected and retransmitted using the checksum bits in the header. 					

Question	Answer	Marks	AO1	AO2	AO3	Total
	<p>Physical Layer</p> <ul style="list-style-type: none"> • It consists of hardware such as switches and routers and deals with all aspects of setting up and maintaining a link between the communicating computers. • Handles raw data in the form of bits, not packets and handles the host to host communication in the network. • It defines the transmission medium and mode of communication between two devices. The medium can be wired or wireless, and the mode can be simplex, half-duplex, or full-duplex. • Specifies the line configuration, data rate (bits per second), and topology in the network. • No specific protocols are used in this layer. The functionality of the physical layer varies from network-to-network. 					

Band	AO1.1b (Max 12 marks)
	9-12 marks
3	<p>The candidate has:</p> <ul style="list-style-type: none"> • 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 a description of the 5 layers, and includes several relevant detailed points on functionality from the indicative content. • addressed the question appropriately explaining the purpose of the model. • used appropriate technical terminology referring to the indicative content accurately.
2	<p>The candidate has:</p> <ul style="list-style-type: none"> • 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 describes the purpose of the model, identifies the 5 layers and includes some relevant detailed points on functionality from the indicative content. • addressed the question, with reference to purpose. • used appropriate technical terminology referring to the indicative content.
1	<p>The candidate has:</p> <ul style="list-style-type: none"> • attempted to address the question but has demonstrated superficial knowledge of the indicative content. Superficial knowledge is defined as a response that does not address all 5 layers and includes limited details on functionality and purpose. • used limited technical terminology referring to the indicative content
	0 marks
	Response not credit worthy or not attempted.