



GCSE MARKING SCHEME

SUMMER 2023

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

INTRODUCTION

This marking scheme was used by WJEC for the 2023 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.

EDUQAS GCSE COMPUTER SCIENCE
COMPONENT 1: UNDERSTANDING COMPUTER SCIENCE
SUMMER 2023 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. (a)	Award one mark for the following: <ul style="list-style-type: none"> • Nybble 	1	1a			1
(b) (i)	Award one mark for the following: <ul style="list-style-type: none"> • 2 KB, 2,050 B, 0.5 GB, 532 MB 	1		1b		1
(ii)	Award one mark for the following: <ul style="list-style-type: none"> • 0.1 PB, 0.01 TB, 0.26 MB, 2,000,000 bits 	1		1b		1
2. (a)	Award one mark for each of the following: <ul style="list-style-type: none"> • Control unit • Motherboard • Sound card 	1 1 1	1b 1b 1b			3
(b) (i)	Award one mark for each of the following: <ul style="list-style-type: none"> • It would be able to process more instructions at the same time. 	1	1b			1
(ii)	Award one mark for each of the following, up to a maximum of one mark: <ul style="list-style-type: none"> • Instructions and data can be provided to the CPU at a much faster rate (than other system memory such as RAM) • More instructions that are repeatedly used by the CPU can be stored. 	1	1b			1
(c) (i)	Award one mark for each of the following up to a maximum of two marks: <ul style="list-style-type: none"> • An embedded system is a combination of software and hardware • that <u>performs a specific task</u> • example of a specific task accepted. 	1 1 1	1b 1b 1b			2
(ii)	Award one mark for the following: <ul style="list-style-type: none"> • Firmware 	1	1a			1

Q	Answer	Marks	AO1	AO2	AO3	Total
3.	<p>Award one mark for each of the following, up to a maximum of four marks:</p> <ul style="list-style-type: none"> • Digital data is uploaded and stored on another server known as "the cloud" • The physical storage spans multiple servers (sometimes in multiple locations) • the physical environment is typically owned and managed by a hosting company • Storage capacity can be increased • These cloud storage providers are responsible for keeping the data available and accessible, and the physical environment secured, protected, and running • People and organisations buy or lease storage capacity from the providers to store data. 	4	1b			4
4. (a)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • \overline{B} • $A \oplus \overline{B}$ • $B \cdot (A \oplus \overline{B}) / A \cdot B$ 	1 1 1		1b 1b 1b		3
(b) (i)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> • $R = \overline{P} \cdot Q$ 	1		1b		1
(ii)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> • $Z = \overline{X} \cdot \overline{Y}$ 	1		1b		1
5. (a)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • Connects devices on a computer network by using packet switching • Receive and forward data to the destination device / A switch analyses each packet of data and sends it to the computer it was intended • Uses MAC addresses to forward data at the data link layer of the OSI model. 	2	1b			2
(b)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • A network bridge creates a single network from multiple communication networks • A bridge joins together two networks that use the same base protocols, e.g. links LAN to LAN • This function is called network bridging • In the OSI model, bridging is performed in the data link layer. 	2	1b			2

Q	Answer	Marks	AO1	AO2	AO3	Total
(c)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • A device that allows WiFi devices to connect to a network • As a standalone device, the WAP may have a wired connection to a router, but, in a wireless router, it can also be an integral component of the router itself. 	2	1b			2
6. (a)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • 95_{10} • $A2_{16}$ • 11111001_2 	1 1 1		1a 1a 1a		3
(b) (i)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • $-17_{10} = 1101111_2$ • $56_{10} = 0111000_2$ • Carry 111 • Binary addition = 0100111_2 	1 1 1 1		1a 1a 1a 1a		4
(ii)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • Overflow • The number is too big to be stored in a 5-bit register. 	1 1		1b 1b		2
7. (a)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • Social engineering • SQL injection • Shoulder surfing 	1 1 1	1b 1b 1b			3
(b) (i)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • The investigation and analysis of all traffic going across a network suspected of use in cybercrime / monitoring and analysis of network traffic to detect intrusion • track communications and establish timelines based on network events logged by network control systems • Network forensics are commonly used to analyse network events in order to track down the source of hack attacks and other security-related incidences. 	2	1b			2

Q	Answer	Marks	AO1	AO2	AO3	Total
(ii)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • A firewall can be a software or hardware security system • that controls the incoming and outgoing network traffic • Packets of data are analysed to determine whether they should be allowed through or not • Monitor where data has come from and where it is going, and determine if this communication is allowed • It does this by checking a list of pre-defined rules. 	2	1b			2
8. (a)	<p>Award one mark for each of the following: $A.\bar{A} + B.(\bar{B} + C)$</p> <ul style="list-style-type: none"> • $0 + B.(\bar{B} + C)$ • $B.\bar{B} + B.C$ • $0 + B.C$ • $B.C$ <p>DO NOT award credit for truth tables.</p>	1 1 1 1		1b 1b 1b 1b		4
(b)	<p>Award one mark for each of the following: $X + Y.\bar{Z} + X.\bar{Y} + X.Y$</p> <ul style="list-style-type: none"> • $X.(1 + \bar{Y} + Y) + Y.\bar{Z}$ • $X.(1 + 1) + Y.\bar{Z}$ • $X.(1) + Y.\bar{Z}$ • $X + Y.\bar{Z}$ <p>DO NOT award credit for truth tables.</p>	1 1 1 1		1b 1b 1b 1b		4

Q	Answer	Marks	AO1	AO2	AO3	Total
9. (a)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • File sharing - you can easily share data between different users, or access it remotely if you keep it on other connected devices • Resource sharing - using network-connected peripheral devices like printers, scanners and copiers, or sharing software between multiple users, saves money. • Allows for collaborative working. • Sharing a single internet connection - it is cost-efficient and can help protect your systems if you properly secure the network. • Increasing storage capacity - you can access files and multimedia, such as images and music, which you store remotely on other machines or network-attached storage devices. • Enables centralised management and deployment. 	2	1b			2
(b)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • IP • SMTP • HTTP. 	1 1 1	1b 1b 1b			3
(c)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • The application layer provides interfaces to the software to allow it to use the network. • The physical layer transmits the raw data / maintains a link between the communicating computers. 	2	1b			2
10. (a) (i)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> • Antivirus software removes any malicious code that has already infected a computer. 	1	1b			1
(ii)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> • Disk partition editors are designed to view, create, modify or delete a logical segment of storage space. 	1	1b			1
(iii)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> • Files are physically re-arranged on disk so that they are no longer split using disk defragmenters. 	1	1b			1
(iv)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> • A file manager allow operations such as creating, opening, renaming, copying, moving, deleting and searching documents stored on a computer system. 	1	1b			1

Q	Answer	Marks	AO1	AO2	AO3	Total
10. (b) (i)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • The process of making a file sizes smaller • Uses lossy or lossless algorithms • Allows more data to be stored on the disk • Files may also be transferred more quickly as a result 	2	1b			2
(b) (ii)	<p>Award one mark for each of the following, up to a maximum of two marks:</p> <ul style="list-style-type: none"> • Manages changes to files • Each change should also include the author, date and written notes on the purpose of each change • Enables going back to previous versions • Crucial when needing to fix problems in older versions of software • Branching and merging - team members work concurrently • Keeps multiple streams of work independent from each other while also providing the facility to merge that work back together • Traceability – being able to trace each change made to the software and connect it to project management and bug tracking. 	2	1b			2
11. (a)	<p>Indicative content</p> <pre> 1 width is real 2 height is real 3 colourDepth is integer 4 storageReqs is real 5 6 input width 7 input height 8 input colourDepth 9 10 storageReqs = width x height x colourDepth 11 12 storageReqs = storageReqs / 1,000,000 13 14 output "The storage requirements are ", storageReqs, "MB"</pre>					7

Q	Answer	Marks	AO1	AO2	AO3	Total
	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • Declare / Initialise variables • Input width • Input height • Input colour depth • Calculate the storage requirements • Conversion into megabytes • Output storage requirements 	1 1 1 1 1 1 1			2a 2a 2a 2a 2a 2a 2a	
(b)	<p>Indicative content</p> <ul style="list-style-type: none"> • <code>newReqs</code> is real • <code>storageSaved</code> is real • • <code>set newReqs = storageReqs / 5 * 2</code> • <code>storageSaved = storageReqs - newReqs</code> • <code>output "Storage space saved = ", storageSaved</code> <p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • Calculate compressed file size using 5:2 ratio • Determine disk space saved • Output disk space saved 	1 1 1			2a 2a 2a	3
12. (a) (i)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • <code>esle</code> (Line 12) • <code>else</code> 	1 1		1b 1b		2
(ii)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • <code>if r < 0 then</code> (Line 9) • <code>if r > 0 then</code> 	1 1		1b 1b		2
(b)	<p>Award one mark for each of the following:</p> <ul style="list-style-type: none"> • An interpreter would interpret each line of code and output the error after each line • A compiler would compile the entire program and output the error at the end. 	1 1		1b 1b		2

Q	Answer	Marks	AO1	AO2	AO3	Total
13. (a)	<p>Award one mark for each of the following, up to a maximum of five marks:</p> <ul style="list-style-type: none"> • The bubble sort starts with comparing the first two items in a list • If they are out of order they are swapped • Subsequent consecutive items are compared, making swaps where necessary • This happens until the end of the list is reached • The process is then repeated • When an iteration results in no swaps being needed, the bubble sort is stopped. 	5	1b			5
(b)	<p>Award one mark for each of the following, up to a maximum of five marks:</p> <ul style="list-style-type: none"> • The data must be in order • The search starts at the mid-point of a list • The data item is compared with the search item, with three possible outcomes: <ul style="list-style-type: none"> ○ the item at the mid-point will match the search item ○ the search item will be less than the item at the mid-point ○ the search item will be greater than the item at the mid-point. • If the search item is less than the item at mid-point, then all the items after the mid-point can be ignored • Similarly if the search item is greater than the mid-point then the first half of the list can be discarded. • This process is then repeated on the remaining data time after time until the required item is found. 	5	1b			5

Q	Answer	Marks	AO1	AO2	AO3	Total
14.	<p>Indicative content</p> <p>GDPR 2018 Data should be:</p> <ul style="list-style-type: none"> • processed lawfully, fairly and in a transparent manner in relation to individuals • collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes • adequate, relevant and limited to what is necessary in relation to the purposes for which it is processed • accurate and, where necessary, kept up to date; every reasonable step must be taken to ensure that inaccurate personal data, with regard to the purposes for which it is processed, is erased or rectified without delay • kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data is processed • processed in a manner that ensures appropriate security of the personal data, including protection against unauthorised or unlawful processing and against accidental loss, destruction or damage, using appropriate technical or organisational measures. <p>Computer Misuse Act 1990 The Act makes it an offence to:</p> <ul style="list-style-type: none"> • access data without permission, e.g. looking at someone else's files • access computer systems without permission, e.g. hacking • alter data stored on a computer system without permission, e.g. writing a virus that deliberately deletes data. <p>Freedom of Information Act</p> <ul style="list-style-type: none"> • People have a right to know about the activities of public authorities, unless there is a good reason for them not to have this information • The Act provides public access to information held by public authorities in two ways: <ul style="list-style-type: none"> ○ Public authorities are obliged to publish certain information about their activities ○ Members of the public are entitled to request information from public authorities 	9	1b			9

Q	Answer		Marks	AO1	AO2	AO3	Total
	Band	AO1.1b (Max 9 marks)					
		7–9 marks The candidate has: <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 seven to nine relevant detailed points from the indicative content • addressed the question appropriately discussing legislation. • used appropriate technical terminology referring to the indicative content accurately. 					
		4–6 marks The candidate has: <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 provides four to six points from the indicative content. • addressed the question, discussing legislation. • used appropriate technical terminology referring to the indicative content. 					
		1–3 marks The candidate has: <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 provides one to three points from the indicative content. • used limited technical terminology referring to the indicative content 					
		0 marks Response not credit worthy or not attempted.					
TOTAL			100	60	30	10	100