GCE A LEVEL MARKING SCHEME

SUMMER 2025

A LEVEL
COMPUTER SCIENCE - COMPONENT 2
A500U20-1

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.

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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 it contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

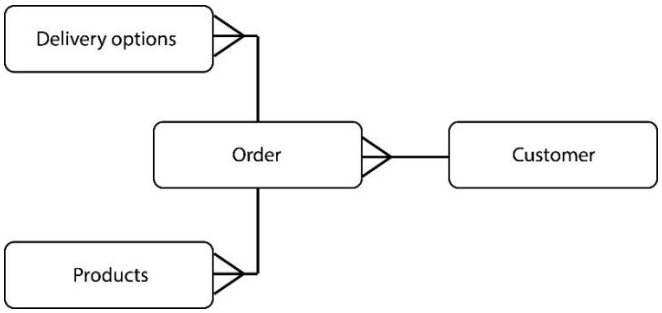
Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
1(a)	**1 mark** for each correct point and **1 mark** for an associated expansion, to a maximum of **6 marks** **Indicative content:** Word size / word length refers to the amount of data a CPU's internal data registers can hold (1) and process at one time. (1) Contemporary desktop computers have 64-bit word size. (1) The larger the word, the faster the computer calculates / processes instructions. (1) With same clock speed, adding a 32 bit number will not be faster in a computer with 64 bit registers than one with 32 bits, (1) but a 40 bit number will require additional steps in a 32 bit processor whereas all 40 bits of the number will fit in the 64-bit register. (1) MHz (million cycles per second) is used to measure the transmission speed / frequency of electronic devices, including a computer's internal clock. (1) 1 MHz speed means bits (16, 32 or 64) can be manipulated one million times per second. (1) A 2GHz clock means two billion times. (1) The combination of speed and width determines the processing performance of the CPU chip (1) and of parallel channels from the CPU to external devices (1)	6	6			10
(b)	**1 mark** for basic description and **1 mark** for suitable expansion to a maximum of **4 marks.** RAM. The main memory of a computer that stores the operating system, applications, and data. (1) It is read / write memory (1) made up of capacitors and transistors that hold an electric charge that represents bits of data. (1) Cache is a small amount of memory that is chip-based (1) used to store frequently accessed data / instructions (1) is more readily available to the processor than the main memory making the retrieval of data from RAM more efficient / speeding up processing time (1). Volatility is not relevant to functions.	4	4			

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
2(a)	**2 marks** for correct conversions, **1 mark** for correct total and **1 mark** for carry bits to a maximum of **4 marks** 58 0 0 1 1 1 0 1 0 +83 0 1 0 1 0 0 1 1 1 0 0 0 1 1 0 1 1 1 1 1	4		4		12
(b)	**1 mark** for correct negative number, and **1 mark** for correct addition, to a maximum of **2 marks** 58 0 0 1 1 1 0 1 0 - 83 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1 1	2		2		
(c) (i)	**1 mark** for description, **1 mark** for example(s) to a maximum of **2 marks.** **Indicative content:** Each hex digit is equivalent to 4 binary digits in the range 0 – 15. Examples $1_{16} = 0001_2$ $9_{16} = 1001_2$ $A_{16} = 1010_2$ $F_{16} = 1111_2$	2	2			
(ii)	**1 mark** for basic description and **1 mark** for suitable expansion to a maximum of **4 marks** Concise (1) the number of digits used is usually less than in binary or decimal. (1) It allows you to store more information using less space (1) and can be used to write large binary numbers in just a few digits. (1) It is simple to convert between hexadecimal numbers and binary. / It is more user friendly (1) and writing in less digits lowers the possibility of errors. (1)	4	4			

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
3(a)	**1 mark** for each correct stage in the conversion. 105.125_{10} 01101001.0010 0.11010010010 with 0111 0.110100100100111	3		3		6
(b)	**1 mark** for each correct stage in the conversion Calculate exponent: 6_{10} Move binary point: 0101101.1 Convert to Decimal: 45.5_{10}	3		3		
4(a)	**1 mark** for correct inputs, **1 mark** for correct shifts, **1 mark** for accurate addition **1 mark** for both values correct in accumulator**.** Register Accumulator `LDR R1,1D` 0111 1001 `LDR R2,1E` 0100 0110 `ASR R1` 0011 1100 `LDA R1` 0011 1100 `ASL R2` 1000 1100 `ADD R2` 1100 1000 `STA R2` 1100 1000	4		4		10
(b)	**1 mark** for required input and output **1 mark** for initialization of registers **1 mark** suitable controlled loop structure **1 mark** load into accumulator **1 mark** use of accumulator for addition **1 mark** save of total in register **Indicative content:** IN n {enter sequence number reqd} LDR R1, n {Load number to count register} LDR R2, 1 {Initialise register} LDR R3, 1 {Initialise register for sequence} LDR R4, 0 {Initialise register for total} LOOP LDA R2 {Load value R2 to accumulator INC R3 {Add 1 to value in R3} ADD R3 {Add R3 value to accumulator}	6			6	

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
	STA R4 {Save accumulator value in R4} DEC R1 {Subtract 1 from value in R1} JGZ R1 LOOP{Loop if R1 value > 0} JEZ R1 END {End if R1 value = 0} END OUT R3 OUT R4 **Alternative solution** LOR R2, 1 {Initialise register} Y LOR R3, 1 {Initialise register for sequence} Z LOR R4, 0 {Initialise register for total} T IN {enter sequence number reqd} STA n {Store in location n} LDR R1, n {Load number to count register} LOOP INC R3 {Increment z} LDA R3 {Load accumulator with Z} ADD R2 {Add Y} STA R4 {Store the accumulator in T} LDR R2, R4 {Y=T} DEC R1 {Subtract 1 from value in R1} JGZ R1 LOOP {Loop if R1 value > 0} JEZ R1 END {End if R1 value = 0} END OUT R2 OUT R3					

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
5(a)	**1 mark** for correct absolute error and **1 mark** for relative error. (Accept relative errors expressed as % errors) 1101.11 =13.75 truncated to 4 bits = 1101 = 13 Absolute error = 13.75 - 13 = 0.75 Relative error = 0.75 / 13.75 = 0.0545	2		2		4
(b)	**1 mark** for correct relative error and **1 mark** for comparison. 001101.11 = 13.75 rounded to 4 bits = 1110 = 14 Absolute error = 14 - 13.75 = 0.25 Relative error = 0.25 / 13.75 = 0.0181 (1) Percentage error = 0.0181 x 100 = 1.81% compared with the 5.45% error produced by truncation. (1)	2		2		
6	**1 mark** for each correct point to a maximum of **6 marks**. Data packets are the base information units that are transferred over the internet. (1). Every data packet contains an IP source address and an IP destination address. (1). Routing is the process of determining the most efficient path an IP packet should follow from the source to its destination. (1) A router is a device that allows multiple devices to connect to the internet (1) and facilitates the forwarding of data packets to their respective destination addresses. (1) The internal components of a router include CPUs to determine the optimal route for the packets / process the routing algorithm (1) The external components include a WAN port to connect to the wide area network or the internet and a LAN port that connects to the local network. (1) When a router receives a data packet, it reads its IP header and checks its routing table (1) and runs algorithms that select the best path to reach that destination. (1).	6	6			6

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
7(a)(i)	**1 mark** for four tables, as indicated and **1 mark** per correct one-to-many relationship. **Indicative content:**  	4		4		14
(ii)	**1 mark** for Primary key in each table, and **1 mark** for each foreign key field in Order table appropriately identified, to a maximum of **4 marks**. Ignore additional fields **Indicative content:** Customer [CustomerID **[P],** Name, email] Order [OrderID **[P],**CustomerID **[F],** OptionID **[F],** ProductID **[F],** Cost.] Delivery options [OptionID **[P],** Delivery address] Products [ProductID **[P],** description]	4		4		
(b)	**1 mark** for each correct description and **1 mark** for each storage requirement to a maximum of **4 marks**. **Indicative content:** Boolean: Either true [1] or false [0] (1); requires 1 bit in memory. (1) String: Usually a sequence of characters, either as a literal constant or as a variable. (1) with a storage requirement of 1 Byte per character (1) / dependent on the character set being used. (1)	4	4			
(c)	**1 mark** for each element, to a maximum of **2 marks**. **Indicative content:** Title tags (1), Meta description (1), Header tags [H1-H6] (1), Image alt text (1).	2	2			

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
8(a)	**1 mark** for correct SELECT, FROM PROJECT, **1 mark** for correct WHERE `SELECT projectID, startDate FROM PROJECT WHERE teamNo = 01`	2			2	10
(b)	**1 mark** for correct SELECT, FROM CLIENT, **1 mark** for correct WHERE clientID = **1 mark** for correct condition serviceType = 'eCommerce' AND archived = N `SELECT tradingName, category FROM CLIENT WHERE clientID = (SELECT clientID FROM PROJECT WHERE serviceType = 'eCommerce' AND archived = 'N')`	3			3	
(c)	**1 mark** for INSERT and VALUES and **1 mark** for all fields in correct order. **Indicative content:** `INSERT INTO PROJECT VALUES (07200, 0901, '01/05/25', 'Design only', 20, 'N');` Do not penalise inclusion of field names	2			2	
(d)	**1 mark** for each of the following, to a maximum of **3 marks**. Correct construct (CREATE TABLE with brackets in correct places) Identifying PRIMARY KEY NOT NULL on key field NOT NULL on mem1,2,3 omitted on mem 4,5 **Indicative content:** `CREATE TABLE TEAM ( teamNo char(2) NOT NULL, tlID char(3) NOT NULL, tlName char NOT NULL, mem1ID char(3) NOT NULL, mem2ID char(3) NOT NULL, mem3ID char(3) NOT NULL, mem4ID char(3), mem5ID char(3), PRIMARY KEY (teamNo) );` Do not penalise syntax errors arising from incorrect punctuation.	3			3	

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
9(a)	**1 mark** for a correct stage in the process to a maximum of **3 marks**. • Reference to finding the first key greater than 1955 (1) • Correct reference to following the pointer to the previous key value (1) • Correct reference to accessing the record 1955 in the data block (1) **Indicative content:** First-Level Index: Open the first-level index, search sequentially through to the first key greater than 1955: 2000. Follow the pointer associated with the previous key: 1000. Second-Level Index: In the second-level index search through keys sequentially to the first key greater than 1955: 2000. Follow the pointer associated with the previous key: 1900. Third-Level Index: In the third-level index under the 1900 pointer, search through keys sequentially to the first key greater than 1955: 1960. Follow the pointer associated with the previous key: 1950. Data Block: Search sequentially within the data block to find key field value 1955 in Product Data block.	3		3		8
(b)	**1 mark** for each correct step in the process to a maximum of **5 marks.** Create second level index block with entries from 2100 to 3000. Link to pointer from 2900 in the first level index to the start of this block. (1) Create a third level index block with entries from 2810 to 2900. Link to pointer from 2900 in the second level index to the start of this block. (1) Create a data block, for records 2890 to 2899 (1) Store the two records 2892 and 2893 in sequential order in the new data block. (1) Link the pointer from 2900 in the third level index to the start of the new data block on disk. (1).	5		5		

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
10	**1 mark** for each correct stage in the calculation to a maximum of **4 marks**. **Indicative content:** 30 MB x 1024 = 30720 KB x 1024 = 31457280 B (1) x 8 = 251658240 b (1) / 1024 = 245760 Kb / 1024 = 240 Mb (1) / 20 = 12 s (1) Accept + / - 1s if transfer rate is calculated as decimal. Allow follow through from errors in calculation	4		4		4
11(a)	**1 mark** for each correct facility to a maximum of **2 marks.** **Indicative content:** File archiving software provides: • enables packing and unpacking a range / collection of archive files / file types (1) • creating archives with high-compression ratios (1). • Used to support encryption of archived files (1). • Has a graphical user interface for archive management. (1)	2	2			6
(b)	**1 mark** for each correct point included in an explanation to a maximum of 4 **marks.** **Indicative content:** A data warehouse is a digital environment for large amounts of data storage that provides access to current and historical information (1) as an archive and for data mining. (1) A data warehouse can be used to store user interactions from a website / application (1) to help clients make data-informed decisions about changes in a product. (1) A data warehouse may be used to store customer lists, product data, mailing lists, sales volumes, sales forecasts etc. (1).	4	4			

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
12	**1 mark** up to a total of **10 marks** awarded by application of mark bands **Indicative content:** **Report introduction** covering purpose (measures to protect security and integrity of the Organisations data) and risks (orders via the Internet, customers and staff data, and uses a remote backup facility – updating files online). **Measures** **User account access controls.** Provide a User Access Management (UAM) system for the secure administration of individual users access levels to network services and resources based on a strategy for role design, and privileged access management. **Multi factor authentication**. Multi-factor Authentication (MFA) offers enhanced security by requiring users to provide multiple forms of identification before accessing their accounts. It reduces the risk of unauthorised access, phishing and brute force attacks. **Backups**. Backup copies should be made on a consistent, regular basis to minimize the amount of data between backups. Retaining multiple copies / generations of data provides flexibility to restore to a point not affected by data corruption or malicious attacks. Incremental backups provide a good solution. **Cryptography / encryption**. Processes for coding information so that only the person a message was intended for can read it. Techniques include algorithms and ciphers that enable the encryption and decryption of stored data. Advanced Encryption Standard (AES), ciphers are considered virtually unbreakable. **Firewalls.** Install a hardware based network firewall to protect all devices connected to the network by monitoring incoming and outgoing data packets and blocking malware and other anomalies. **Antivirus software** is essential. This scans all devices and storage systems on the network and should remove malware that has penetrated system defences. **Intrusion detections systems (IDS)** Another level of defence. An IDS passively monitors network traffic, comparing data packets with signature patterns and raising an alarm when suspicious activity is detected. Unlike a firewall, an IDS does not actively block traffic; the primary role is to provide alerts if any anomalies are	10	10			10

Q	Marking Guidance	Mark	AO1	AO2	AO3	Total
	detected. **Web proxy filters**. Used as a prevention tool to block access to sites that commonly host malware, and to monitor information that is sent out over the Internet, to ensure that sensitive data is not released. **Vulnerability management**. An important and continuous, automated process that aims to keep computer networks safe from cyberattacks and data breaches by addressing potential security weaknesses, using tools such as vulnerability scanners, patch management software, and penetration testing programs. **Mobile enabled devices**, as used by home workers or under a BYOD policy create weaknesses that require consideration and staff awareness training to reduce risks arising from: • Security and social engineering attacks, such as phishing • Accidental data leaks e.g. forwarding emails to unintended recipients. • Wi-fi access, particularly due to lack of security on home networks • Out of date and unpatched software • Weak passwords • Lost, unattended or stolen devices. **Recommendation. I**mplement a computer security incident response plan covering measures for: • Training employees on the procedures for handling computer security incidents or compromises. • Detection and analysis: Employing stated measures for Identifying and investigating suspicious activity to confirm a security incident. • Employing stated measures for containment, eradication, and recovery: Isolating affected systems, removing malware, affected systems, and restoring systems / data. • Post incident analysis of the incident, its cause and potential for improving the incident response plan, and associated measures.					
	Totals		**44**	**40**	**16**	**100**

Mark Bands

Band	AO1 Max 10 Marks
3	**Award 8-10 Marks** The candidate has: • written an extended response that has a sustained line of reasoning which is coherent, relevant, and logically structured • shown clear understanding of the requirements of the question and a clear knowledge of the topics as specified in the indicative content. Clear knowledge is defined as a response that makes eight + points in areas signalled in the indicative content. The top of the mark range would require a clear response presented as a report. • addressed the question appropriately with minimal repetition and no irrelevant material • effectively drawn together different areas of knowledge, skills and understanding from all relevant areas across the course of study • used appropriate technical terminology referring to the indicative content confidently and accurately.
2	**Award 5-7 Marks** The candidate has: • written a response that has an adequate line of reasoning with elements of coherence, relevance, and logical structure • shown adequate understanding of the requirements of the question and a • satisfactory knowledge of the topics as specified in the indicative content. Satisfactory knowledge is defined as a response that makes five to eight points in areas signalled in the indicative content. • drawn together different areas of knowledge, skills and understanding from at least two areas across the course of study used appropriate technical terminology referring to the indicative content.
1	**Award 1-4 Marks** The candidate has: • written a response that that lacks sufficient reasoning and structure • attempted to address the question but has demonstrated superficial knowledge of the topics specified in the indicative content. Superficial knowledge is defined as a response that makes one to four points in all areas signalled in the indicative content. • used limited technical terminology referring to the indicative content.
0	**Award 0 Marks** Response not credit worthy or not attempted.