

Cambridge IGCSE™

COMPUTER SCIENCE

0478/01

Paper 1 Computer Systems and Logic

For examination from 2029

MARK SCHEME

Maximum Mark: 75

Specimen

This document has **12** pages.

General Marking Principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: - the specific content defined in the mark scheme - the specific skills defined in the mark scheme or in the level descriptions - the standard of response required as exemplified by the standardisation scripts.
2	Examiners must award whole marks (not half marks, or other fractions).
3	Examiners must award marks positively . This means that: - marks are not deducted for errors or omissions - marks are awarded for correct/valid answers as defined in the mark scheme and also for other valid answers which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate - the quality of spelling, punctuation and grammar are judged only when the mark scheme indicates that these features are specifically assessed in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must consistently apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the full range of marks defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and must not award marks with grade thresholds or grade descriptions in mind.

Question	Answer	Marks	Guidance
1(a)	66	1	
1(b)	61	1	
1(c)	1100101	1	
1(d)	It represents all letters from the English alphabet It represents denary numbers	2	

Question	Answer	Marks	Guidance
2(a)	it has a header it has a payload it has a trailer	3	
2(b)	Less storage space on the web server is required.	1	
2(c)	Run length encoding // RLE Huffman coding	2	
2(d)	Any four from: - parallel would allow fastest transmission ... of the large amount of data - data can be uploaded and downloaded but this does not have to be at the same time - data is not required to travel a long distance ... therefore skewing is not a problem	4	

Question	Answer	Marks	Guidance
3(a)	One mark for correct carry row (zeros do not have to be present) 011000110 One mark for correct right nibble 0110 One mark for correct left nibble with no overflow shown 1100 carry 1 1 1 1 0 1 0 1 0 1 0 1 + 0 1 1 1 0 0 0 1 answer 1 1 0 0 0 1 1 0	3	
3(b)	11100001	1	

Question	Answer	Marks	Guidance
4(a)	One mark for each correct term in the correct place. The structure of language statements in a computer program is called the syntax. A programming language that uses natural language statements is called a high-level language. When programs are written in this type of language they need a translator to convert them into machine code.	4	

Question	Answer	Marks	Guidance
4(b)	Any three from: • code editor • run-time environment • translator • error diagnostics • auto-completion • auto-correction • pretty printing • AI assistance	3	
4(c)	Any three from: For example: • allocating memory to processes • loading processes into RAM • paging and segmentation • creating/managing virtual memory • memory protection	3	

Question	Answer	Marks	Guidance
5	Three marks for 4 correct lines Two marks for 2/3 correct lines One mark for 1 correct line component program counter (PC) memory data register (MDR) accumulator (ACC) control unit (CU) statement sends signals to manage the flow of data in the central processing unit (CPU) stores the next instruction to be processed stores the address of the next instruction to be processed stores the interim results of calculations	3	

Question	Answer	Marks	Guidance								
6(a)	One mark for each correct core principle <table><tr><th>statement</th><th>core principle</th></tr><tr><td>This verifies a user's identity to make sure that they are allowed access to data.</td><td>Authenticity</td></tr><tr><td>This provides proof of sending and receiving data so that the transmission of data can be traced.</td><td>Non-Repudiation</td></tr><tr><td>This makes sure that data cannot be altered or deleted in an unauthorised way, therefore data is accurate and trustworthy.</td><td>Integrity</td></tr></table>	statement	core principle	This verifies a user's identity to make sure that they are allowed access to data.	Authenticity	This provides proof of sending and receiving data so that the transmission of data can be traced.	Non-Repudiation	This makes sure that data cannot be altered or deleted in an unauthorised way, therefore data is accurate and trustworthy.	Integrity	3	
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Question	Answer	Marks	Guidance
6(b)	Any three from: • brute-force attack • data interception • distributed denial of service (DDoS) attack • malware // by example (virus, worm, Trojan horse, spyware, adware, ransomware) • pharming • phishing • social engineering • structured query language (SQL) injection	3	

Question	Answer	Marks	Guidance
7(a)	One mark for each logic gate in the correct place, with the correct inputs	4	

Question	Answer	Marks	Guidance																																				
7(b)	Four marks for 8 correct outputs Three marks for pairs of correct outputs Two marks for pairs correct outputs One mark for pair of correct outputs <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>X</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	A	B	C	X	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	4	
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8	One mark for the correct features in a row <table><thead><tr><th>feature</th><th colspan="2">IP address</th></tr><tr><th></th><th>IPv4</th><th>IPv6</th></tr></thead><tbody><tr><td>It is a 128-bit address.</td><td></td><td>✓</td></tr><tr><td>It can be static or dynamic.</td><td>✓</td><td>✓</td></tr><tr><td>It uses a dot to separate numbers.</td><td>✓</td><td></td></tr><tr><td>It can contain hexadecimal numbers.</td><td></td><td>✓</td></tr><tr><td>It can be used to identify a device on a network.</td><td>✓</td><td>✓</td></tr><tr><td>It contains four sets of numbers.</td><td>✓</td><td></td></tr></tbody></table>	feature	IP address			IPv4	IPv6	It is a 128-bit address.		✓	It can be static or dynamic.	✓	✓	It uses a dot to separate numbers.	✓		It can contain hexadecimal numbers.		✓	It can be used to identify a device on a network.	✓	✓	It contains four sets of numbers.	✓		6	
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9	One mark for each correct cloud storage model <table><tr><th>statement</th><th>cloud storage model</th></tr><tr><td>The services and infrastructure are provided by a third party.</td><td>Public</td></tr><tr><td>The services and infrastructure are dedicated to a single organisation.</td><td>Private</td></tr><tr><td>It is the most cost-effective cloud storage model to initially implement.</td><td>Public</td></tr><tr><td>The services and infrastructure are normally dedicated to a single organisation but can be expanded to include those provided by a third party.</td><td>Hybrid</td></tr></table>	statement	cloud storage model	The services and infrastructure are provided by a third party.	Public	The services and infrastructure are dedicated to a single organisation.	Private	It is the most cost-effective cloud storage model to initially implement.	Public	The services and infrastructure are normally dedicated to a single organisation but can be expanded to include those provided by a third party.	Hybrid	4	
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Question	Answer	Marks	Guidance
10(a)	Any two from: For example: - the robot is more accurate when planting seeds - the robot does not need to take breaks // works 24/7 - the robot will not get bored of performing a repetitive task - the farmer can perform other tasks whilst the robot is planting the seeds - the robot may be faster/more efficient (at planting seeds) - safer as the robot can work in a more dangerous environments (e.g. with animals in a field) - doesn't need to pay labour costs/wages	2	
10(b)	Any two from: For example: - the robot may have been expensive to purchase - the robot may need maintenance and this may be costly - farmer/workers may be de-skilled - farmer may need training in how to use the robot - if it breaks the farmer will need to manually plant - if faulty it may cause damage to farm/seeds - cannot adapt to a new/unexpected event	2	
10(c)(i)	input layer hidden layers output layer	3	

Question	Answer	Marks	Guidance
10(c)(ii)	Any two from: For example: - creating a map of the field - learning the best route - learning where obstacles are - learning the terrain - learning when to plant a seed / closeness / depth - learning how to adapt to different soil types	2	
10(c)(iii)	Any four from: For example: - it could create inequality amongst farmers as only some farmers can afford it - there could be issues with accountability for harm caused by the robot - if robots are trained on biased/inaccurate data this will cause unwanted results/performance - AI collecting and storing data subject to misuse by 3rd parties - potential to collect data without consent could cause privacy issues - AI in farming may require more resources which impacts on the environment	4	

Question	Answer	Marks	Guidance
11(a)	- classical computer stores data as bits ... whereas a quantum computer (QC) stores data as qubits - classical computer can only store data in two states ... whereas a QC can store data in more than two states - classical computer can only store data in one state at a time ... whereas a QC can store data in multiple states at a time - classical computer uses binary logic ... whereas a QC use quantum logic gate - classical computer uses electrons to store data ... whereas a QC uses qbits (made from either photons or electrons)	4	

Question	Answer	Marks	Guidance
11(b)	For example: • solve some complex problems a lot faster • very efficient at finding the optimal solution to a task • can process many possible inputs at the same time • energy efficient when solving certain complex problems • qubits can process/hold massive amounts of data	2	