Mark Scheme

Summer 2019

Pearson Edexcel GCSE In Computer Science (1CP1)
Paper 01: Principles of Computer Science

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional Guidance	Mark
1(a)	**C** Unsigned integers store more positive values **The only correct answer is C** **A** is not correct because unsigned integers are not more accurate **B** is not correct because overflow errors can still occur with unsigned integers **D** is not correct because the use of a parity bit is not relevant to the scenario.		**1**

Question Number	Answer	Additional Guidance	Mark
1(b)	Award **one** mark for sight of either 1024^4 **OR** x4 Award **both** marks for a correct expression including 1024^4 **AND** x4 (with nothing else) e.g. 1024^4 x 4 Accept for 1024^4 any equivalent showing understanding that 1 terabyte is 2^{40} bytes e.g. ● 1024 x 1024 x 1024 x 1024 (bytes) ● 2^{10} x 2^{10} x 2^{10} x 2^{10} (bytes) ● 1,099,511,627,776 (bytes) Award **both** marks for 4,398,046,511,104 (bytes).	Equivalent expressions are awarded.	**2**

Question Number	Answer	Additional Guidance	Mark
1(c)	Award **both** marks for. ● P AND (T OR S) ● (P AND T) OR (P AND S) Award **one** mark for: ● (P AND T) OR S ● P AND T OR S	Award equivalent expressions Award equivalent symbols: NOT, ¬, ~, ! AND, ∧, •, & OR, V, +, || Do not award '+' as equivalent to 'AND'	**2**

Question Number	Answer	Additional Guidance	Mark
1(d)	One from : ● 68 ● 82 – 14 ● R – D ● 18 – 4 Plus ● 0100 0100	Final conversion must be expressed in 8 bits.	**2**

Question Number	Answer data	Additional Guidance	Mark
1(e)	To prevent unauthorised reading/use/analysis/understanding (1) of sensitive/payment/personal/customer data (1)	Do not accept unauthorised **access** for first mark.	**2**

Question Number	Answer	Additional Guidance	Mark
2(a)	A linked description such as: A record for each guest (1) that uses attributes for guest characteristics (1)	Responses may refer to table, records, fields, relationships, keys	**2**

Question Number	Answer	Additional Guidance	Mark
2(b)	WAN / Wide Area Network		**1**

Question Number	Answer	Additional Guidance	Mark
2(c)	Indicative content: ● Cost - can be cheaper than hardware / can cost a lot for large amounts of data ● Space - likely to get more than on physical drives ● Scalability ● Trust / Control ● Physical security ● Access (read/write) speeds and impact on uses/applications ● Shared storage vs dedicated ● Often belongs to a third party ● Bandwidth limitation ● Data vulnerability due to unknown provider ● Access from any Internet devices		**6**

Level	Mark	Descriptor
	0	No rewardable content
Level 1	1-2	Basic, independent points are made showing elements of knowledge and understanding of key concepts/principles of computer science. The discussion will contain basic information with little linkage between points made.
Level 2	3-4	Demonstrates adequate knowledge and understanding of key concepts/principles of computer science. The discussion shows some linkages and lines of reasoning with some structure.
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting relevant knowledge and understanding of key concepts/principles of computer science to support discussion being presented. The discussion shows a well-developed, sustained line of reasoning which is clear, coherent and logically structured.

Question Number	Answer	Additional Guidance	Mark
2(d)	B – TCP/IP **The only correct answer is B** **A** is not correct because HTML is not a protocol **C** is not correct because an ISP is not a protocol **D** is not correct because a URL is not a protocol		**1**

Question Number	Answer	Additional Guidance	Mark
2(e)	A description to include two from: ● each node/device is connected to multiple other nodes/devices ● it is decentralised ● ensures data can still be routed to the destination address if one node fails ● self-configuring		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)	A description to include **three** from: ● NAND (memory) ● If a row/column/set of transistors conduct current / are open/charged, then this represents a 1 ● If row/column/set transistors do not conduct current / are closed/uncharged, then this represents a 0 ● Arranged in a grid (columns/rows) ● At row/column intersections, two transistors (control gate and floating gate) create a 'cell' ● By applying voltage to the control gate transistors ● Electrons flow onto the floating gate ● Creates a net positive charge that interrupts current flow Accept 'Contain transistors' if mark not already awarded from MP2, MP3, MP5	If the response contains content from mark point 2 or mark point 3 that **refers to the effect of current** on setting the state (0 or 1) of transistors; and contains an expansion to show that the opposite state is possible, then award 2 marks.	**3**

Question Number	Answer	Additional Guidance	Mark
3(b)	Any two from: ● Repairing files ● Compression ● Defragmentation ● Back up ● Anti-virus / anti-spyware / anti-malware ● Firewall ● Managing application updates ● Format disks/drives ● System analysis tools		**2**

Question Number	Answer	Additional Guidance	Mark
3(c)	https://www.pearson.co.uk/secondary/programming/python.html		**2**

Question Number	Answer

3(d)

Indicative content:

HLLs	LLLs
Rich set of instructions for sequencing, selection, repetition, and iteration. supplemented by a library of ready-made functions.	Limited instruction set.
A few lines of code can represent a complex task, such as a loop	There are no complex constructs, so every task, such as an if-statement, has to be made from smaller steps.
Support many different data types, such as string, integer, and Boolean.	There are no data types, such as string and integer.
Variables and data can be used in dynamic ways and created only when needed.	The programmer is responsible for managing all their own data.
One line of high-level language generates several executable instructions.	One line of low-level code maps directly to one execution instruction.
There are usually several different editors available which incorporate syntax checkers.	There may be a limited set of tools available for syntax checking.
There are usually several different development environments which provide debugging tools.	There may be a limited set of tools available for helping to debug programs.
Translation is required by all HLLs	Assembly language requires an assembler and machine code does not require translation at all.
Programmers don't have to know the details of a specific machine architecture to write code in a HLL	Programmers have to know the details of a specific machine architecture to write code in a LLL.
HLL uses English-like command words and is therefore easier for a novice programmer to	Mnemonics; or binary code is harder for a novice programmer to read/write/understand.

	read/write/understand		
	HLLs require more memory space.	LLLs require less memory space.	

Level	Mark	Descriptor
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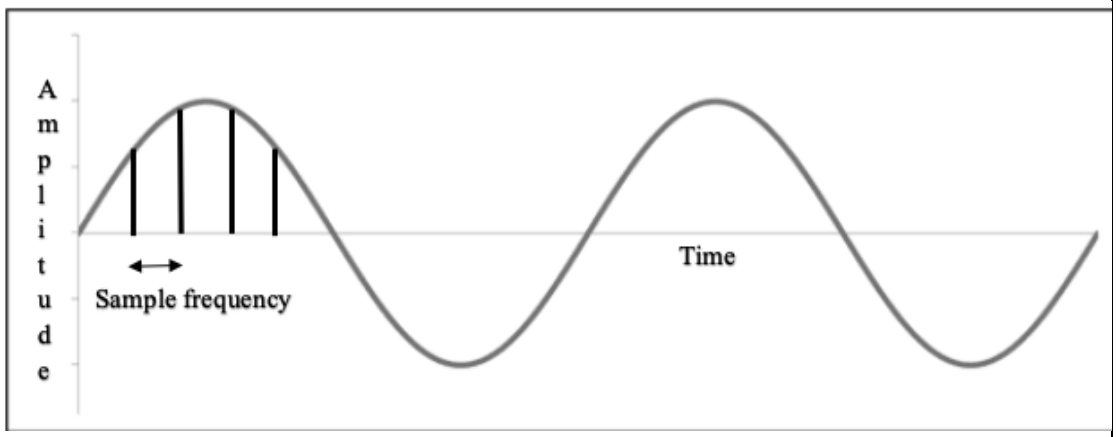
Level 2	3-4	Demonstrates adequate knowledge and understanding of key concepts/principles of computer science. The discussion shows some linkages and lines of reasoning with some structure.
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting relevant knowledge and understanding of key concepts/principles of computer science to support discussion being presented. The discussion shows a well-developed, sustained line of reasoning which is clear, coherent and logically structured.

Question Number	Answer	Additional Guidance	Mark
4(a) (i)	X axis correctly labelled (1) Y axis correctly labelled (1) Sample frequency indicated (1) Do not award marks if wavelength is labelled, rather than sample frequency. Accept for sample frequency if two points given that are shorter than the wavelength.  		**3**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	The amplitude / original sound can be represented more accurately. Accept: • Better (sound) quality • Higher fidelity • Clearer (sound)		**1**

Question Number	Answer	Additional Guidance	Mark
4(b)	B – RAM **The only correct answer is B** ***A*** *is not correct because the ALU does not hold a program* ***C*** *is not correct because a hard drive does not hold a currently executing program* ***D*** *is not correct because the control unit does not hold a program*		**1**

Question Number	Answer	Additional Guidance	Mark

4(c)	Total number of bits to transfer: **1 mark for** 20×1024^2 **1 mark for** $\times 8$ Speed in bits per second: **1 mark for** 2×1000000 Numerator/Denominator: **1 mark for** $$\frac{bits\ to\ transfer}{bits\ per\ second}$$ e.g: $$\frac{\mathbf{20 \times 1024 \times 1024 \times 8}}{\mathbf{2 \times 1000000}}$$	Any equivalent expression to be awarded	**4**

Question Number	Answer	Additional Guidance	Mark
4(d)	A description such as: ● Input from sensor (1) ● The input level is compared against pre-set values (1) ● Output to LED/speaker (1)		**3**

Question Number	Answer	Additional Guidance	Mark
4(e)	A. Copper cable B. Fibre optic		**2**

Question Number	Answer	Additional Guidance	Mark
5(a)	1101 1000		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)	A description to include **two** from: ● (Cache) Stores regularly accessed instructions/data ● Reduces the need to access instructions/data from main memory ● Makes up for the difference in speed of the CPU and main memory		**2**

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	3D	Award one mark for each nibble in the correct location	**2**

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	Hexadecimal is used as a short-hand for binary / uses fewer digits/characters (1) so **humans** make fewer mistakes / find it easier to read/understand/remember/manipulate (1).	Do not accept answers suggesting fewer digits save storage/memory	**2**

Question Number	Answer	Additional Guidance	Mark
5(d)	A description to include **four** from: The control unit increments the program counter (1) **The control unit sends** a signal (1) along the control bus (1) …to the memory/MAR (to tell it to send) (1) …(the address of) the memory location (holding the instruction) (1) …which is loaded **onto the address bus** (1) …(and carried to RAM to tell it to) load the **instruction/** contents of the memory location **onto the data bus** (1) …along which it is **carried** to the MDR/MBR. (1)		**4**

Question Number	Answer	Additional Guidance	Mark
5(e)	It is not sorted		**1**

Question Number	Answer	Additional Guidance	Mark
6(a)	Award **one** mark for either: Sight of: 1024×1024 OR Sight of: divided by 64 Award **both** marks for correct expression, e.g.: $\frac{1024 \times 1024}{64}$	Accept any other equivalent mathematical expression.	**2**

Question Number	Answer	Additional Guidance	Mark
6(b)	A description such as: The OS uses part of the secondary storage to act as part of main memory (1). The OS moves programs that are not immediately needed out of main memory (1) and stores them in virtual memory / secondary storage (1) using paging (1) Active programs are swapped into main memory (from virtual memory) (1).		**4**

Question Number	Answer	Additional Guidance	Mark
6(c)	Any **one** from: ● To check for bad programming practices ● To check for vulnerabilities in the programming language ● To check efficiency of code	Do not accept: 'Checking for errors' if not qualified with 'not picked up in testing'.	**1**

Question Number	Answer	Additional Guidance	Mark
6(d)	A description such as: Ransomware / malicious attachment/download (1) encrypts the user's files (1). To get the key/decrypt the files (1) … …(the user must pay a ransom to the code writers / remove the malware)	Do not accept 'link' for mp1	**3**

Question Number	Answer	Additional Guidance	Mark
7(a)	A linked description to include **two** from: ● Reads the packet **header** ● Takes the recipient's address ● Compares the (recipient's) address to the addresses of all devices that are connected to it (which are stored in the router's routing table) ● Forwards the packet / network traffic **to its destination** ● Using the quickest/most efficient route.		**2**

Question Number	Answer	Additional Guidance	Mark
7(b)	An explanation such as: Changes in requirements / technology (1) mean that security can be improved/compromised (1) OR Changes in law/regulations (1) mean that requirements/technology must change (1) **Do not accept** statements about unauthorised access / security that do not refer to **changes** in requirements / technology etc.	Linked points required for two marks.	**2**

Question Number	Answer	Additional Guidance	Mark
7(c)	A description such as: Each packet has a sequence number (added at the sending end) (1) The packets are put back into (sequence) order (at the destination) (1).		**2**

Question Number	Answer	Additional Guidance	Mark
7(d)	A response to include **two linked** points, such as: ● Some children may not have devices / can afford devices (1), so the school might have to provide them (1) ● Some students will have more advanced devices (1), thereby having different learning opportunities (1) ● Screen readers / facilitating programs (1) improve access for students with disabilities (1) ● Access may not be appropriate (1) for students from some religions / cultures (1) ● Opens opportunities for access to experts (1) thereby providing for individual needs (1)		**4**

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