Pearson Edexcel

Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE
In Computer Science (4CP0/01)

Paper 01: Principles of Computer Science

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Summer 2022
Question Paper Log Number P72538A
Publications Code 4CP0_01_2206_MS
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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.

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Question Number	Answer	Additional Guidance	Mark
1(a)(i)	Award **one** mark from: • An action/task that is carried out (by the CPU) (1) • An operation/code that is/will be executed (by the CPU) (1) • Something that tells the CPU/processor/device what to do (1)	Allow examples	1
1 (a)(ii)	Award **one** mark from: • A pointer/reference to/identification of a location in memory (1) • A pointer/reference to/location where data will be accessed from/stored (to)(1)		1

Question Number	Answer	Additional Guidance	Mark
1(b)	**The only correct answer is D** *A is not correct because the address bus carries the address of the memory location* *B is not correct because the data bus carries but does not store data* *C is not correct because the control unit sends signals but does not handle the data*		1

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	Award **one** mark from: • More instructions can be carried out per second (1) • Processes run faster (1) • Programs executed faster (1) • Can run more complex programs (1)		1
1(c)(ii)	Award **one** mark from: • The CPU/computer could overheat (1) • More cooling required (1) • Needs more power (1) • CPU could become unstable/crash / its lifespan could be shortened (1)		1

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Question Number	Answer	Additional Guidance	Mark
1(d)	**The only correct answer is D** *A is not correct because it describes a method of accessing data from a secondary storage device* *B is not correct because it describes the multi-agent computational model* *C is not correct because it describes the parallel computational model*		1

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<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(e)(i)</td><td>Award one mark from:

• When fast execution of the program is essential/gives faster execution (1)
• When writing code to control a device / directly access the hardware (1)
• To make efficient use of a device's limited storage/memory/power (1)
• When writing code for a particular architecture/hardware/embedded system (1)</td><td></td><td>1</td></tr>
<tr><td>1(e)(ii)</td><td>Award one mark for:

• To translate/convert assembly language into machine/object code (1)</td><td></td><td>1</td></tr>
<tr><td>1(e)(iii)</td><td>Award one mark for any two correct rows (1)
Award two marks for any four correct rows (2)
Award three marks for all five correct rows (3)

<table>
<tr><th>Description</th><th>Compiler</th><th>Interpreter</th></tr>
<tr><td>Translates the program each time it is executed</td><td></td><td></td></tr>
<tr><td>Produces permanent object code</td><td></td><td></td></tr>
<tr><td>Translates line by line</td><td></td><td></td></tr>
<tr><td>Translates the whole program before it is run</td><td></td><td></td></tr>
<tr><td>Generates a list of errors once the complete program has been translated</td><td></td><td></td></tr>
</table>
</td><td>Row can only be correct if there is only one tick.</td><td>3</td></tr>
<tr><td colspan="3">Total for question 1</td><td>11</td></tr>
</table>

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Question Number	Answer	Additional Guidance	Mark
2(a)(i)	Award up to **two** marks for: • 0100 (1) 1110 (1)	Accept any number of leading zeros.	2
2(a)(ii)	**The only correct answer is B** *A is not correct because standard ASCII uses 7 bits, 64 characters would need only 6 bits* *C is not correct because standard ASCII uses 7 bits, 256 characters would need 8 bits* *D is not correct because standard ASCII uses 7 bits, 512 characters would need 9 bits*		1
2(a)(iii)	Award up to **two** marks for a linked explanation such as: All of the major languages/symbols/characters can be represented by Unicode (1) because it uses a minimum of 16 bits/more bits/32 bits/65536 characters (1) Unicode can represent all/more characters/any language (1) whereas ASCII can only represent English/Latin/128 characters/doesn't have enough characters (1) Unicode can represent all characters (1) because it uses 16 bits/2 bytes /more bits instead of 8 bits/1 byte (1)	Accept the reverse argument Allow examples of non-latin characters	2

Question Number	Answer	Additional Guidance	Mark
2(b)	1010 1011 Award up to **two** marks for: • MSB = 1 (1) • Rest of pattern correct 010 1011 (1)		2

Question Number	Answer	Additional Guidance	Mark
2(c)	Award up to **two** marks for: • 0100 (1) 1010 (1)		2

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<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>2(d)(i)</td><td>Award up to two marks for:

• 3 bits used for all patterns (1)/
• No pattern repeated (1)

Example:

<table><tr><th>Colour</th><th>Binary pattern</th></tr><tr><td>Green</td><td>000</td></tr><tr><td>Black</td><td>001</td></tr><tr><td>White</td><td>010</td></tr><tr><td>Red</td><td>011</td></tr><tr><td>Blue</td><td>100</td></tr></table></td><td></td><td>2</td></tr>
<tr><td>2(d)(ii)</td><td>Award one mark for each of:

• 3579 x 6128 x 32 (1)
• ÷ 8 (1)
• + 732 (1)
• ÷ (1000 x 1000) (1)

Examples

$\frac{\frac{3579 \times 6128 \times 32}{8} + 732}{1000 \times 1000}$

$\frac{((3579 \times 6128 \times 32) \div 8) + 732}{1000 \times 1000}$

$\frac{(3579 \times 6128 \times 4) + 732}{1000 \times 1000}$</td><td>• Units are not required
• Equivalent expressions are accepted
• Calculations not explicit but expressed gain the mark
• Award 1 mark for correct calculated answer of 87.73 if no other marks awarded</td><td>4</td></tr>
<tr><td colspan="3">Total for question 2</td><td>15</td></tr>
</table>

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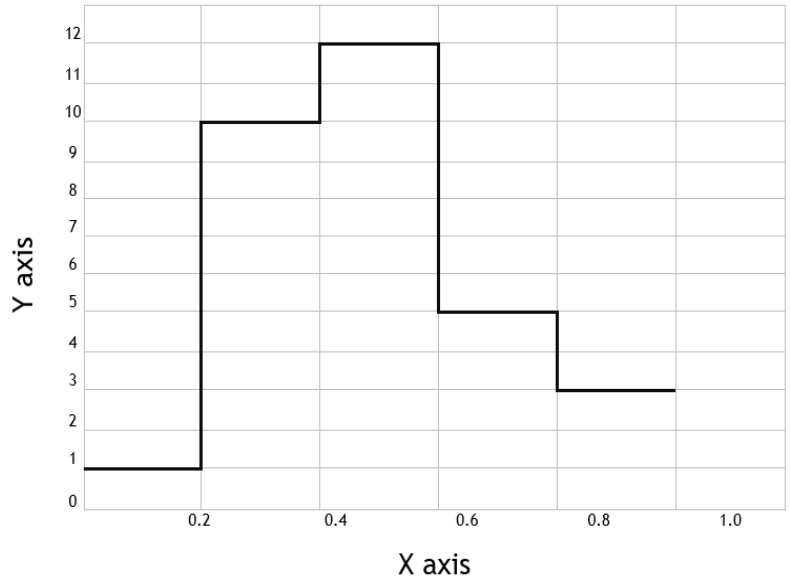
<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(a)(i)</td><td>Award one mark for each of:

• At least four conversions plotted at the correct amplitude (1)
• Correct start point (1) 0 – 1 digital. 0 – 0 analogue
• Digital sound wave drawn (1) using candidate's plots

<table><tr><th>Sample number</th><th>Denary value</th></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>10</td></tr><tr><td>3</td><td>12</td></tr><tr><td>4</td><td>5</td></tr><tr><td>5</td><td>3</td></tr></table>
 
</td><td>MP1 does not have to start at 0.2 - 1</td><td>3</td></tr>
<tr><td>3(a)(ii)</td><td>Award one mark for:

• Time (1)
• Sample interval/period (1)
• Seconds (1)</td><td></td><td>1</td></tr>
<tr><td>3(a)(iii)</td><td>Award one mark for:

• Amplitude / sound level / volume (1)
• Metres/centimetres/nanometres (1)
• m/cm/nm (1)</td><td></td><td>1</td></tr>
</table>

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<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(b)(i)</td><td>Award one mark from:

• Transfer time would be longer (1)
• Larger file size / less compression (1)
• Takes up more storage space (1)
• Uses more of her data allocation (1)</td><td></td><td>1</td></tr>
<tr><td>3(b)(ii)</td><td>Award up to two marks for a linked explanation such as:

• Storage capacity can be scaled up and down (1) so no need to buy more secondary storage / only pay for what is used/needed (1)
• Will have the files all in one place (1) rather than scattered across many secondary storage devices (1)
• Files can be uploaded/downloaded anytime/anywhere/on any device (1) so long as there is an internet connection (1)
• Can be set up to automatically backup / synchronise with mobile devices (1) therefore if any files/devices are lost/stolen her files will be available on the server (1)</td><td>Do not award a mark for cheaper without expansion.</td><td>2</td></tr>
<tr><td>3(b)(iii)</td><td>Award one mark from:

• Storage host could be targeted by hackers (1)
• Alyssa has less control over her files (1)
• An untrustworthy employee (of the cloud storage provider) could steal her files (1)
• Reliant on the storage provider for security / safekeeping (1)
• Files could be intercepted/corrupted during upload/download (1)</td><td></td><td>1</td></tr>
<tr><td>3(b)(iv)</td><td>Award one mark for each of:

<table><tr><th>URL component</th><th>Description</th></tr><tr><td>https</td><td>Protocol / scheme (1)</td></tr><tr><td>www.cloudisfab.com</td><td>Domain (name) / host / name of website (1)</td></tr><tr><td>re12</td><td>Folder/directory (on the website) / path / part of path(1)</td></tr></table></td><td></td><td>4</td></tr>
</table>

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	ru2.mp3	File/media/resource wanted (on the website)/ path / part of path (1)		
			Total for question 3	**13**

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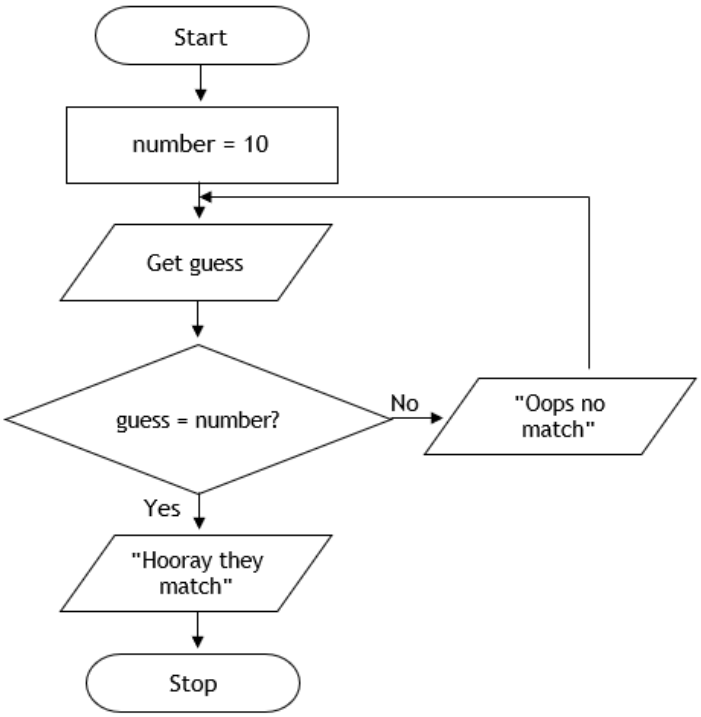
Question Number	Answer (flow chart replaced)	Additional Guidance	Mark
4(a)(i)	Award up to **five** marks for: • Start and stop terminators in the correct positions (1) 1-3 • Number set to 10 AND Get guess in the correct positions (1) 4-6 • Loop back to before Get guess and after number set to 10 if there is no match (1)Does not need to go via message box • Yes/no labels on decision match output messages (1) 4-6 • Correctly connected as in MS image, with at least 6 arrows correct (1) 7-9  	Boxes should be marked by content rather than shape.	5
4(a)(ii)	**The only correct answer is C** *A is not correct because a simulation is a completed program* *B is not correct because a cipher is a form of encryption* *D is not correct because a truth table is a method of testing an algorithm*		1

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Question Number	Answer	Additional Guidance	Mark
4(b)(i)	Award **one** mark for: • D		1
4(b)(ii)	Award **one** mark for: • B		1

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	Award up to **four** marks for: • RedPoints column correct (1) • OrangePoints AND NumOranges columns correct (1) • Score correct in row 8 OR row 9 (1) -1 or below • Outputs correct and starting on the same row as the score OR the row below (1) can all be on one line		4

Colour	Score	Red Points	Orange Points	Num Oranges	Outputs
	0	0	0	0	
red		1			
orange			8	1	
red		2			
red		3			
orange			16	2	
-1					
	19				
					Score: 19
					Number of reds: 3
					Number of oranges: 16

4(c)(ii)	Award **one** mark for: • 23		1

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4(c)(iii)	Award **one** mark for: • Pseudododе that replaces OrangePoints with NumOranges on line 23 (1) SEND ("Number of oranges: "& NumOranges) TO DISPLAY		1
		Total for question 4	**14**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	Any **two** from: • It will interpret/analyse patient input to identify symptoms (1) and match the symptoms to (possible) illnesses (1) • It will match symptoms to possible illnesses (1) and give the most likely/probable illness (1) • It will match symptoms to possible illnesses (1) and ask further questions to narrow it down (1) • It will match symptoms to possible illnesses (1) by searching/using a database/other data store (1)		2
5(a)(ii)	Award **one** mark from: 1. May not have access to the internet (1) 2. May not have access to a device (1) 3. May not want to use it (1) 4. May not have the technical knowledge to use it (1) 5. May have a physical disability that stops them from using the service (1) 6. May not want to disclose personal information (1) 7. hacking or security or data issue (1) 8. May not trust the AI/system (1) 9. Can't take physical measurements eg. blood pressure (1) 10. may want a real person (1)		1

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Question Number	Answer	Additional Guidance	Mark
5(b)(i)	Award **one** mark for: • Local area network / LAN /VLAN		1
5(b)(ii)	Award **one** mark for: • Wide area network / WAN		1

Question Number	Answer	Additional Guidance	Mark
5(c)	**The only correct answer is C** *A is not correct because this is phishing* *B is not correct because this is shoulder surfing* *D is not correct because this is pharming*		1

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<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(d)(i)</td><td>Award up to two marks for a linked explanation such as:

• Robust/less likely to break it if dropped / quieter than a mechanical hard drive (1) because it doesn't have any moving/mechanical parts (1)
• Smaller/thinner/lighter than a device with HDD (1) so easier to carry/more portable / laptops have less room in them for drives/componants(1)
• SSD uses less power (1) so battery will last longer (1)
• SSD is faster (1) so can access data/records more quickly (1)</td><td></td><td>2</td></tr>
<tr><td>5(d)(ii)</td><td>Any two from:

• Flash memory chips are used (1)
• Chips have (floating gate) transistors/electron pools/charge traps (1)
• Gates/electron pools/charge traps hold an electrical charge (1)
• Charge remains even when no power (1)
• No charge/empty pool/trap represents data/1 (1)
• A charge/full pool/trap represents no data/0 (1)
• Data is stored in blocks and pages (1)</td><td></td><td>2</td></tr>
<tr><td>5(d)(iii)</td><td>Award one mark for each of:

<table><tr><th>Description</th><th>RAM</th><th>ROM</th></tr><tr><td>Stores the boot up sequence</td><td></td><td></td></tr><tr><td>The contents are lost when the laptop is shut down</td><td></td><td></td></tr></table></td><td></td><td>2</td></tr>
<tr><td colspan="3">Total for question 5</td><td>12</td></tr>
</table>

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Question Number	Answer	Additional Guidance	Mark
6(a)(i)	Award up to **two** marks for a linked explanation such as: • Can transfer data quickly / reduced chance of packet collisions (1) as data only flows in one direction (1) • No need for a server/switch/hub (1) because the packets do not have to be directly routed to a specific device / each workstation controls connectivity / packets are passed from workstation to workstation until the destination is reached (1) • Every workstation gets equal access to resources (1) because each station has to wait until it gets a token / devices do not have to compete to get a token (1) • Additional workstations can be easily added/easy to set up (1) because each workstation only connects to two other workstations (1) • Easy to find faults (1) all of the tokens will end up on one workstation (1) • Cheap to set up (1) uses minimum cabling (1)	Not a **Comparison** without expansion that fits mark scheme	2
6(a)(ii)	Award up to **two** marks for a linked explanation such as: • It needs to be easily scalable (1) mesh topology allows this as it is decentralised / nodes connect with other nodes around them (1) • Can handle high volumes of data traffic (1), because data can travel via multiple routes (1) • Is self-healing/resilient/allows alternative paths (1), which means data will still reach its destination even if a node or connection fails(1) Not system/computer/switch etc • Enables it to span a huge geographic area (1), because additional nodes can be added to expand coverage (1)		2

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	Award **one** mark for: • Personal area network / PAN/WPAN		1

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6(b)(ii)	Award up to **two** marks for a linked explanation such as: • A faster connection speed (1) because fewer users/devices sharing the bandwidth/connection (1) • Improved security /stated security issue(1) because it uses secure cellular data connection / not on public network /Santiago has to approve users(1)		2

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	Award **one** mark from: • A record of activities/specified activity that have taken place on a computer system (1) • Automatic record of what has happened and who did it (1)		1
6(c)(ii)	Award **one** mark from: • To identify suspicious/malicious activity/changes (1) • To increase accountability (1) • To trace a problem back to its source/perpetrator (1) • To find out if any users are using unauthorised applications (capable of putting the network at risk) (1)		1

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Question Number	Answer	Additional Guidance	Mark
6(d)	**Ethical hacking** • Ethical hackers are white hat hackers • Attempt to access the network as a hacker does • Don't attempt to change or steal data • Looking for weaknesses in the network • Weakness pointed out • Weaknesses fixed • Could be employed by the business • Could work for another specialist company • Can include penetration testing **Commercial analysis tools** • Software used to find weaknesses • Can be configured to check for a range of weaknesses • Results/reports generated identifying faults • Weaknesses fixed **Review of network and user policies** • Collection of rules and guidelines that govern the behaviours of network devices/users • Need reviewing because may not comply with new laws and regulations • Reviews should be scheduled		6
		Total for question 6	**15**

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 the discussion being presented. The discussion shows a well-developed, sustained line of reasoning which is clear, coherent, and logically structured.

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