Pearson Edexcel

Mark Scheme (Results)

Summer 2024

Pearson Edexcel GCSE In
Computer Science (1CP2/01)
Paper 1: 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)	**The only correct answer is C** *A is not correct because abstraction is hiding or removing detail* *B is not correct because computation is the act of computing* *D is not correct because evaluation is reaching a conclusion*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)	Award **one** mark for any of the following up to a maximum of **two** marks: • The subprogram code only has to be written once / saves development time (1) • The subprogram can be called many times (reusability) (1) • The subprogram only has to be debugged once (1) • It is easier to locate and debug errors (1) • Hides the details of how a function/procedure/code works (abstraction) (1) • Can be used by programmers who don't have the knowledge to write them (1) • Can be grouped into libraries/can be shared with other programmers (1) • Makes programs easier to read/understand (1) • Reduces the overall size of code (1) • Problem can be decomposed into smaller sub-problems (1) • Allows a team to work on a project (1)	Do not accept generalisations such as easier/faster/quicker without qualification	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	Award **one** mark for any of the following: • 15 (1)		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	Award **one** mark for any of the following: • 11 (1)		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	Award **one** mark for any of the following: • 16, 17, 18, 19 (1) • 16 - 19 (1) • 16, 18 (1)	Do not accept 16 on its own.	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(d)(i)	Award **one** mark for any of the following: • Code that breaks/violates the rules/grammar of the programming **language** (1)	Do not award credit for an example in isolation such as missing colon, there must be a definition.	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(d)(ii)	Award up to **two** marks for a linked explanation, such as: • The program crashes/stops (1) because the operation the computer is asked to do is impossible (1) • The program crashes (1) because the CPU cannot execute one of the instructions in the code (1)	For both marks, the expansion must follow/associate with the statement. Do not award credit for an example in isolation such as division by zero. Be careful not to award marks for syntax/logic error	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(e)(i)	Award **one** mark for each: • True (1) • False (1)	Do not award 0, 1, Yes, No Allow T/F for True/False	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(e)(ii)	**The only correct answer is C** *A is not correct because 0.5 is the fractional part of division* *B is not correct because 1 is the remainder after integer division, i.e. the result of modulus* *D is not correct because 2.5 is the result of division*		**(1)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(f)(i)</td><td>Award one mark for each correct cell:

<table>
<tr><th>Algorithm type</th><th>Characteristic</th><th>Algorithm name</th></tr>
<tr><td>Search</td><td>Is a divide and conquer algorithm</td><td>Binary search (1)</td></tr>
<tr><td>Sort</td><td>Is not a divide and conquer algorithm</td><td>Bubble sort (1)</td></tr>
</table>
</td><td>Ignore exclusion of the words 'search' and 'sort' in the last column</td><td>(2)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(f)(ii)</td><td>Award up to two marks for a linked explanation, such as:

• A sorting algorithm executes more quickly (1) because a small number of comparisons are made (1)
• A sorting algorithm executes more slowly (1) because a large number of comparisons are made (1)</td><td>For both marks, the expansion must follow/associate with the statement.</td><td>(2)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	Award **one** mark for: • 7 (1)	Do not award 8, as that is Extended ASCII	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	Award **one** mark for: • D (1)	Do not award lowercase	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)	Award **one** mark for: • The time/number of seconds/gap between samples/measurements (1)	Do not accept answers defining sampling frequency	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)	Award **one** mark for any of the following up to a maximum of **two** marks: • width × height (1) • units expressed as pixels (1) Examples: • width in pixels × height in pixels • width × height pixels • size in pixels = width × height	Allow values in any order Allow synonyms such as length for the x/y dimension Only award 2 marks for a fully correct expression	**(2)**

<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 one mark for each correct cell:

<table>
<tr><th>Binary pattern</th><th>Shift</th><th>8-bit binary result</th></tr>
<tr><td>1010 0011</td><td>Logical shift left by 3</td><td>0001 1000 (1)</td></tr>
<tr><td>1100 1010</td><td>Arithmetic shift right by 2</td><td>1111 0010 (1)</td></tr>
</table>
</td><td></td><td>(2)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>2(d)(ii)</td><td>The only correct answer is B

A is not correct because all overflow errors do not cause programs to crash
C is not correct because computers don't use hexadecimal, only humans do
D is not correct because indexing outside an array bounds is a runtime error</td><td></td><td>(1)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
2(d)(iii)	Award **one** mark for each correct nibble in the correct order: • 0111 0000	0 marks if response is not 8-bit binary	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(d)(iv)	Award **one** mark for each correct nibble in the correct order: 1011 0111	0 marks if response is not 8-bit binary	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(e)(i)	**The only correct answer is D** *A is not correct because the binary system has two symbols* *B is not correct because the octal system has eight symbols* *C is not correct because the denary system has ten symbols*		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(e)(ii)	Award **one** mark for any of the following: • 256 (1) • 2^8 (1) • 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 (1)	Allow any equivalent programming expression, such as 2^8, 2**8	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(f)	Award **one** mark for any of the following up to a maximum of **two** marks: • Sight of 1024^4 anywhere for number of bytes in a tebibyte (1) • 40 681 930 227 712 ÷ 1024^4 (1) Examples: 40 681 930 227 712 ÷ 1024^4 40 681 930 227 712 / 1024^4 $\frac{40\,681\,930\,227\,712}{1024 \times 1024 \times 1024 \times 1024}$ $\frac{40\,681\,930\,227\,712}{2^{40}}$	Award equivalent expressions Ignore transcription errors The first mark is for knowing the conversion units. The second mark is for an accurate expression.	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	Award **one** mark for any of the following: • LAN (1) • Local area network (1)	Allow: Wireless LAN (WLAN) Personal Area Network (PAN)	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	Award **one** mark for any of the following: • Range (1)	Do not allow length / distance	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	Award **one** mark for any of the following up to a maximum of **two** marks: • The whole network stops working if the backbone/cable is broken (1) • The number of collisions increases/the network will slow down as the number of devices/users increases (1) • A greater security risk (because all the nodes on the network see all the data packets) (1) • The network stops working if the terminators are missing/not working (1) • Only one device can transmit data at a time (1)	Do not award responses associated with installation, either cost, extra wires, or invasiveness	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	Award up to **two** marks for a linked description, such as: • It is an authorised attack (black box/white box) on a network/system (1) to identify security vulnerabilities (1) • It is a network/system attack carried out with the knowledge of an organisation (1) to recommend measures that should be taken to improve security (1)	For both marks, the expansion must follow/associate with the statement.	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	Award **one** mark for: • Wi-Fi (1) • Bluetooth (1)	Ignore capitalisation and hyphenation Allow ZigBee	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	Award **one** mark for any of the following: • File Transfer Protocol (1) • FTP (1)	Ignore capitalisation	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(d)	Award up to **two** marks for a linked description, such as: • It converts the data into a suitable signal/electrical/radio (1) for transmission on the media Ethernet cable/Wi-Fi (1) • It uses/adds a physical/MAC address (1) for a source/destination (1) • Receives data from the network layer (1) to send via physical hardware (1)	For both marks, the expansion must follow/associate with the statement.	**(2)**

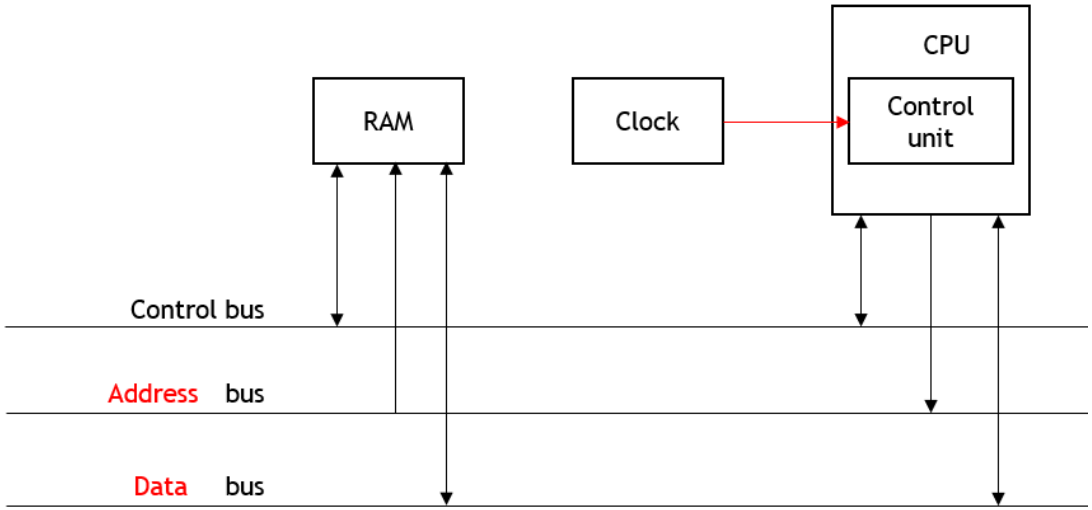
Question Number	Answer	Additional Guidance	Mark
3(e)	Award **one** mark for: • 13 x 60 or 780 (seconds) (1) • $1.4 \times 8 \times 1024^3$ (1) • 1000^2 (1) • Fully correct response (1) Example: $$\frac{1.4 \times 8 \times 1024^3}{13 \times 60 \times 1000^2}$$	Award equivalent expressions	**(4)**

Question Number	Answer	Additional Guidance	Mark
4(a)	Award **one** mark for any of the following up to a maximum of **two** marks: • Translates the whole program in one go (1) • Errors are reported at the end of translation (1) • The executable/machine code is architecture specific (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)	Award up to **two** marks for a linked description, such as: • Uses a hierarchical/tree structure (1) with a root node/directory (1) • Each position on the tree/path (1) is a directory/sub-directory/folder, or file (1) • Each file has a unique path (1) in relation to the root (1)	For both marks, the expansion must follow/associate with the statement.	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(c)	Award up to **two** marks for a linked explanation, such as: • An audit trail improves accountability (1) because it keeps track of who makes changes / when changes are made (1) • An audit trail makes going back to an earlier version easier (1) because changes are tracked (1)	For both marks, the expansion must follow/associate with the statement.	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(d)	Award up to **two** marks for a linked description, such as: • The **camera** reads the registration plate (1) which is looked up in the **database**/checked in the **database** (to see that the fee has been paid) (1)	For both marks, the expansion must follow/associate with the statement.	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(e)	Award **one** mark for each of: • Address bus labelled correctly (1) • Data bus labelled correctly (1) • Unidirectional arrow from clock to control unit (1)  	Allow clock connection to CPU box	**(3)**

Question Number	Answer	Additional Guidance	Mark

4(f)	Indicative content:
	
	Built-in devices
	
	• A low-level language may be used to write the code for the built-in devices.
	  ○ Low-level languages are microprocessor dependent, so are designed to work efficiently with a single chipset, like you find in a phone.
	  ○ Low-level language can manipulate hardware directly, which makes it suitable for writing device drivers, like the receiver for the recorder.
	  ○ Low-level languages can be optimised to reduce execution time, so are good for a real-time system, like focusing the camera.
	  ○ Low-level languages also generate smaller executable code than high-level languages so are good for devices with smaller amounts of RAM, like the phone.
	• A high-level language may be used to write the code for the built-in devices.
	  ○ A high-level language compiler must exist to generate code for the phone's chipset.
	  ○ Some high-level languages provide libraries/subprograms which allow direct access to devices.
	  ○ Some high-level languages allow programmers to write in-line assembly code for microchips.
	  ○ Some high-level languages have customisable optimisation options for tuning the efficiency (executing time/resource usage) of programs
	
	Applications:
	
	• A high-level language should be used to write the code for the applications.
	  ○ Any new applications, written in a high-level language, would be portable to a different version of the phone.
	  ○ The email application should be written in a high-level language, because tools are available to make development quick.
			(6)

	○ Any time an application had to interface with the devices, such as sending an email, a library of subprograms would be provided to allow that. ○ High-level languages have libraries of specialised subprograms to complete advanced actions, such as editing an image.		

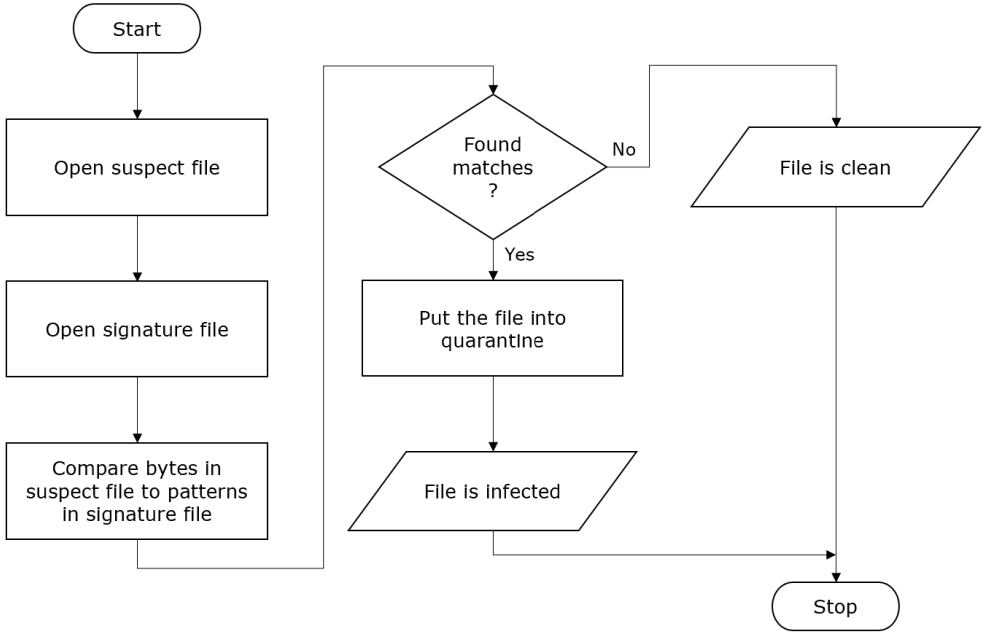
Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made, showing elements of understanding of key concepts/principles of computer science. (AO1) The discussion will contain basic information with little linkage between points made or application to the context. (AO2)
Level 2	3–4	Demonstrates adequate understanding of key concepts/principles of computer science. (AO1) The discussion shows some linkages and lines of reasoning with some structure and application to the context. (AO2)
Level 3	5–6	Demonstrates comprehensive understanding of key concepts/principles of computer science to support the discussion being presented. (AO1) The discussion is well developed, with sustained lines of reasoning that are coherent and logically structured, and which clearly apply to the context. (AO2)

Question Number	Answer	Additional Guidance	Mark
5(a)	Award up to **two** marks for a linked description, such as: • Shorter replacement cycles lead to devices being disposed of more often (1), which leads to more e-waste/landfill / pollution (1) • Shorter replacement cycles lead to more manufacturing (1), which incurs increased extraction of metals/increased use of water to manufacture chips/use of fossil fuels (1) • Long replacement cycles mean devices are not disposed of (1), which reduces the amount of e-waste/landfill / emissions (1) • Long replacement cycles mean fewer devices are manufactured (1), which reduces the need for extraction of metals / the need for water to manufacture chips / less energy required (1)	For both marks, the expansion must follow/associate with the statement.	**(2)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(b)</td><td>Award one mark for each correct cell:

<table>
<tr><th>Intellectual property</th><th>Method of protection</th></tr>
<tr><td>A hardware invention</td><td>Patent (1)</td></tr>
<tr><td>An advertising slogan</td><td>Trademark (1)
Copyright (1)</td></tr>
</table>
</td><td></td><td>(2)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(c)	Award up to **two** marks for a linked explanation such as: • The wipers/lights come on automatically (1) because sensors detect rain/darkness (1) • Speed is automatically adjusted/brakes are applied automatically / alarm sounded (1) because sensors detect distance from other cars/obstacles/people (1) • The temperature is adjusted automatically (1) because a sensor/thermometer monitors the change in the temperature of the passenger compartment/car interior (1)	For both marks, the expansion must follow/associate with the statement.	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(d)	Award **one** mark for any of the following up to a maximum of **six** marks: • load virus signature file/database (1) • scan/compare target file (for virus signature) (1) • decide if a virus has been detected (1) • quarantine/isolate/fix/delete file when virus detected (1) • no further action required if virus not detected (1) • all decision boxes have exactly two labelled outputs and all arrows are directed and there are no hanging symbols (1)  	BP2 must be clear **how** the virus is detected, not just 'detect virus'	**(6)**