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# Mark Scheme (Results)

## November 2021

Pearson Edexcel GCSE In
Computer Science (1CP0/01)
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.

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| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1(a)** | D | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1(b)** | Any **two** from:<br>• Anti-virus<br>• Anti-spyware<br>• Firewall<br>• File management<br>• File repair/recovery<br>• File conversion<br>• Compression<br>• Defragmentation<br>• Back up | Accept 'anti-malware' if mark not already awarded for Mark point 1/2 | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1(c)** | Machine code / binary (1)<br>Processor / CPU (1) | Accept 'computer' | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1(d)** | An explanation to include **two** linked points such as:<br>• The source code is not available (1) because the compiler converts the code to machine code (1)<br>• Compiled code is not human readable (1) so nobody else can alter it or sell it on (1)<br>• Compiled code is difficult/impossible to reverse engineer (1) so nobody else can alter it or sell it on (1) | | **2** |

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| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(a)** | | | **6** |

| X | Y | Z | Y AND Z | X OR (Y AND Z) |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 |

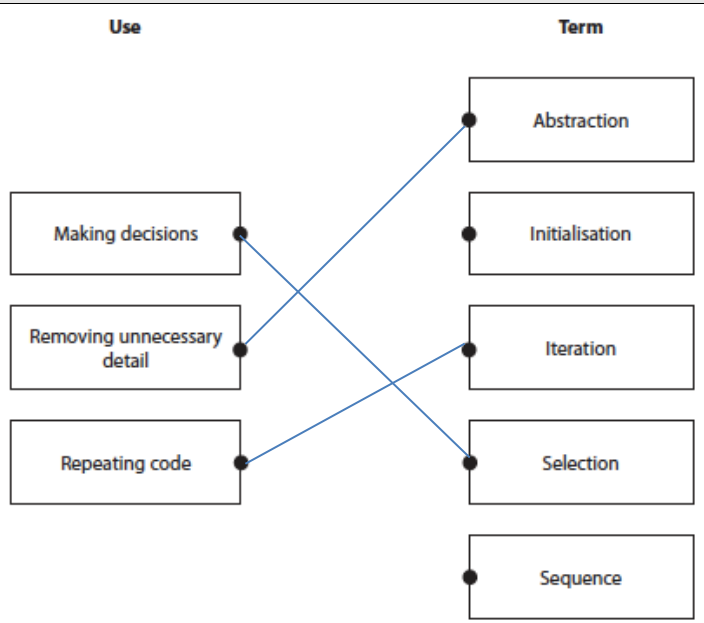
| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(b)** | Arithmetic Logic Unit / ALU | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(c)** | Process | | **1** |

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| Question Number | Answer | Additional Guidance | Mar |
|---|---|---|---|
| **2(d)** | Any **one** from:<br>• To store frequently used instructions (1)<br>• To act as a buffer (1)<br>• To make up the difference in the speed between RAM and the CPU (1) | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(a)** | A description to include:<br>A sequence of instructions (1) that solves a problem (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(b)** |  | | **3** |

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| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(c)** | An explanation such as:<br>(Inclusion) reduces the divide/disadvantage in society (1) because more people have access (1) | Mark point 1 can be awarded for reference to: legal requirements / increased sales | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(d)** | An explanation such as:<br>• Less CO2 is produced by people travelling to work (1) because people can use the internet to work remotely (1)<br>• More energy efficient homes (1) because smart technologies can switch the lights off when no one is in the room (1)<br>• Endangered species can be protected (1) because GPS technologies can track their locations (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(e)** | A description to include **two** linked points such as:<br>Freedom to view the source code (1) and modify/distribute it (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(f)** | A description to include **two** points such as:<br>• Essential features such as colours/images/suits/numbers/values (1) can be used to | | **2** |

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| | | | |
|---|---|---|---|
| | represent a general model of a card (1)<br>• No need to consider physical features of cards / just need to know essential features (1) e.g. suit, value, rank (1) | | |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(a)** | • 32<br>• $2^5$ | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(b)** | AD | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(c)** | **Binary:** One mark for 1110 0011<br>**Denary:** One mark for 227 | Allow follow through. | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(d)** | One mark for each nibble in the correct location:<br>0100 0101<br><br>Or **one** from:<br>• H – E (1)<br>• 72 – 3 (1)<br>• 69 (1) | Binary must be expressed using 8 bits for both marks. | **2** |

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| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(e)** | A comparison to include **two** from:<br><br>Effect on sample resolution (1)<br>e.g. More levels of amplitude can be represented (with 24 bits)<br><br>Effect on accuracy of representation (1)<br>e.g. The sound is more like the original (with 24 bits)<br><br>Effect on transmission speed/storage/memory (1)<br>e.g. Takes longer to transmit / creates larger file sizes / uses more memory (with 24 bits) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(f) (i)** | One mark for each nibble:<br><br>0 0 1 1 1 0 1 0<br>1 0 1 1 0 0 1 1<br>1 1 1 0 1 1 0 1 | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(f) (ii)** | It will produce an overflow error (1) because there are not enough available bits (1) | | **2** |

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| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(a)** | **One** from:<br>• Instructions for the game do not change.<br>• RAM is volatile.<br>• Users aren't expected to alter the game's code or assets | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(b)** | An explanation such as:<br>To store actions /progress during the game (1) because this data is changeable (1)<br>OR<br>RAM stores data that can change (such as variable values) (1) which is needed to store scores/progress during the game (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(c)** | A linked response to include **two** from:<br>Logic allows for decisions to be made (1) enabling a range of options/pathways/scenarios to be provided (1) that can adapt to ability of the player / how the player plays (1)<br><br>Example response:<br>Logic is used to compute the output response (1) generated by the player's action given their location and the location and actions of other players in the game environment (1) | | **2** |

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| Question Number | Answer | Additional Guidance | Mar |
|---|---|---|---|
| **5(d)i** | 000 0011<br>010 0101<br>(1)<br><br>000 0100<br>(1)<br><br>010 0001<br>111 0011<br>010 0001<br>000 0011<br>(1) | | **3** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(d)ii** | One mark for sight of each:<br><br>• 10x9 (1)<br>• x7 (1)<br>• 10x9/15x7 (1)<br><br>Award all four marks for a complete expression including minus sign and expressed with the correct order of operations.<br>e.g.<br>(10x9x7)-(10x9/15x7) | Award equivalent expressions e.g.<br>• (10x9x7)-(6x7)<br>• (90x7)-(6x7) | **4** |

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| Question Number | Answer | Additional Guidance | Mar |
|---|---|---|---|
| **6(a)** | A | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(b)** | A description to include **three** linked points from:<br><br>ROM contains (1) the firmware for the motherboard / BIOS / Boot sequence / Start-up instructions (1) that loads the operating system (1) from secondary storage (1) into RAM (1) | | **3** |

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| Question Number | Indicative content |
|---|---|
| **6(c)** | **Lower order responses: -**<br>HDD vs SSD<br>Low cost/High capacity vs High cost/Low capacity<br>Low vs High energy efficiency<br>Slow vs fast access speeds<br>**Higher order responses:**<br>Access speeds negated by network latency<br>SSD access speeds faster, so could be used for database software to provide quicker lookups.<br>Larger storage capacity means used for file storage provided by HDD<br>Files written to SSD as faster and then permanently stored / Backed up to HDD<br>Frequently stored data 'cached' on SSD. |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No rewardable content |
| **Level 1** | 1-2 | A comparison may be attempted but with limited application of knowledge and understanding of key concepts/principles of computer science to the theoretical context.<br>The comparison will contain basic information with some attempt made to link knowledge and understanding to the given context. |
| **Level 2** | 3-4 | A comparison will be given with adequate application of knowledge and understanding of key concepts/principles of computer science to the theoretical context. Lines of reasoning are occasionally supported through a linkage<br>The comparison shows some linkages and lines of reasoning with some structure. |
| **Level 3** | 5-6 | A comparison will be given with comprehensive application of knowledge and understanding of key concepts/principles of computer science to the theoretical context. Line(s) of reasoning are supported throughout by sustained application of relevant evidence.<br>The comparison shows a well-developed and sustained lines of reasoning which is clear, coherent and logically structured. |

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| Question Number | Answer | Additional Guidance | Mar |
|---|---|---|---|
| **7(a)** | C | | **1** |

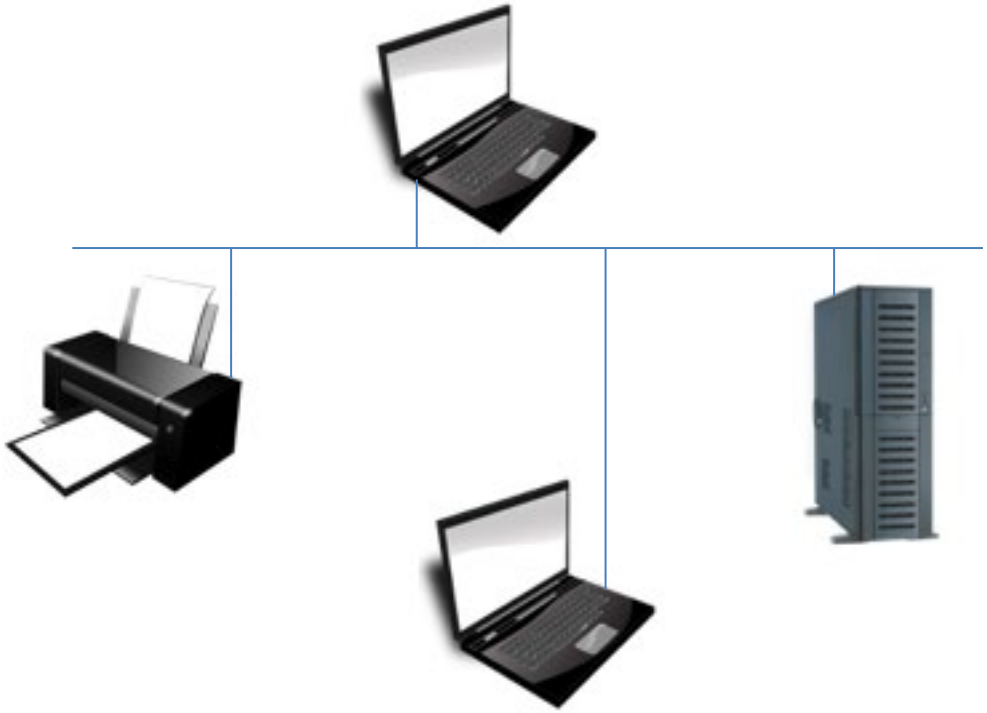
| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(b)** | An explanation to include **two** from:<br>• IMAP retains the data on a server (1) which can be read by any computer (1)<br>• POP3 downloads the data to the client (1) so it would not be available from a different computer (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(c)** | A linked description to include **four** from:<br><br>Splits the data into packets (1) and numbers them (1)<br>using a checksum (1) to see if packets have been delivered correctly (1) to avoid error/data corruption detection (1) before reordering them at their destination (1)<br><br>Award other linked points such as:<br>resends packets if found to be corrupt/missing on arrival (1)<br>handles handshaking and transmission details (1)<br>establishes a dedicated channel between source and destination devices (1)<br>communicates with the application layer above and the network layer below (1) | | **4** |

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| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(d)** | Responds to incoming client requests (1) by supplying a service/resource (1)<br><br>Examples:<br>File/web/mail/database server (1) stores resources (data/files) and delivers (data/files) / manages requests (for data/files) (1)<br>Print server (1) manages requests for print jobs (1) | | **2** |

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| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(e)** | Single line not directly connected to any device (bus) (1) single lines connecting each device to bus (1)<br> | | **2** |

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| Question Number | Indicative content |
|---|---|
| **8** | • Validation and authentication techniques (access control, physical security and firewalls)<br>• Security issues associated with the 'cloud' and other contemporary storage<br>• Different forms of cyberattack (based on technical weaknesses and behaviour) including social engineering (phishing, shoulder surfing), unpatched software, USB devices, digital devices and eavesdropping<br>• Methods of identifying vulnerabilities including penetration testing, ethical hacking, commercial analysis tools and review of network and user policies<br>• How to protect software systems from cyber-attacks, including considerations at the design stage, audit trails, securing operating systems, code reviews to remove code vulnerabilities in programming languages and bad programming practices, modular testing and effective network security provision |

| 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.<br><br>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.<br><br>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.<br><br>The discussion shows a well-developed, sustained line of reasoning which is clear, coherent and logically structured. |