Pearson
Edexcel

# Mark Scheme (Results)

## November 2020

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)** | One mark for each pair of digits in the correct location.<br>DE AF C4 | | **3** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1(b)** | **Binary:** One mark for 0001 0010.<br>**Denary:** One mark for 18 | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1(c)** | **One** from:<br>The number of pixels per $cm^2$/$in^2$ (1)<br>The number of pixels on the vertical axis x the number of pixels on the horizontal axis (1)<br>The amount of detail that can be seen (1) | Do not accept:<br>'Number of pixels' on its own | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **1(d)** | A comparison to include:<br><br>Effect on colour depth (1)<br>• More colours can be represented (with 24 bits)<br>Effect on accuracy of representation (1)<br>• So the image looks more realistic<br>Effect on transmission speed/storage/memory (1)<br>• But takes longer to transmit / creates larger file sizes / uses more memory | | **3** |

| Question Number | Answer data | Additional Guidance | Mark |
|---|---|---|---|
| **1(e)** | An explanation such as:<br>The file size is reduced (1) because repeated values (1) are assigned a number (that represents the count of the repeats) (1)<br>OR<br>File size is only reduced (1) if there are lots of run lengths of repeated values (1). In some instances, the 'compressed' file size is actually larger than the original. (1)<br>OR<br>Compressing a black and white image will produce a smaller file size (1) than producing a coloured image because only a single bit needed (1) to indicate the presence/absence of colour (1).<br>OR<br>There will be no loss of quality (1) because RLE is a lossless compression algorithm (1) meaning the exact bit pattern is represented (1) | | **3** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(a)** | **One** from:<br>1. Background checks<br>2. Access control<br>3. Physical security<br>4. User policies | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(b)** | A Authentication | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(c)** | An explanation to include **two** from:<br>To prevent unauthorised access (1) so that data remains confidential (1) by making it unintelligible (1) because it is scrambled (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(d)** | A description such as:<br>The position of letters in the alphabet are shifted (1) left/right/number of positions determined by a key (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **2(e)** | An explanation to include **three** linked points from:<br>To reduce electricity usage (1) because servers generate lots of heat (1), which would otherwise require air conditioners (1) that can be replaced with natural cooling systems [e.g. water pumped from rivers] (1) | | **3** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(a)** | An explanation such as:<br>Access to the network/Internet will be removed/unstable (1) because IP addresses have to be unique (1)<br><br>*Award one mark for a response such as:*<br>*So that data is routed to the correct recipient* | Example response:<br>'Devices must have a unique IP address (1) because otherwise, a switch would not know which of the two was the correct device to send packets to (1) | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(b)** | D – Star | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(c)** | ((3 X 1000 X 1000 X 1000) ÷ 8) x 10<br><br>1 mark for $3 \times 1000^3$<br>1 mark for ÷ 8<br>1 mark for x 10 | | **3** |

| | | | |
|---|---|---|---|
| | | | |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(d)** | B – 4 | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(e)** | B – Utility | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(f)** | C – SMTP | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(g)** | To provide access to the Internet | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(h)** | C - Structured | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(a)** | Any **one** from:<br>Inputs (type of keyboard, sensor)<br>Outputs (type of printer, etc)<br>Processing (Calculations, loops, selections)<br>Initialisation | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(b)** | 1 mark for each correct row. | | **4** |

| **A** | **B** | **NOT (A OR B)** |
|---|---|---|
| 1 | 1 | 0 |
| 0 | 1 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 1 | | | |
| | | 1 | 0 | 0 | | | |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(c)** | ROM / Read Only Memory | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(d)** | **Two** examples such as:<br>- Flight simulators<br>- Financial modelling | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(e)** | An explanation such as:<br>Because it will be subject to movement (1) and it does not use mechanical/moving parts (e.g. a read/write head) (1)<br>OR<br>Solid state storage is smaller/more compact (1) so better suited for a wearable device (1)<br>OR<br>Doesn't have moving parts (1) because they could be disrupted during use (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(a)** | C - Processor | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(b)** | Any **two** from:<br>• Registers<br>• Clock<br>• CU<br>• ALU | | **2** |
| Question Number | Answer | Additional Guidance | Mark |
| **5(c)** | Response identifies any **four** from:<br>• data and instructions are stored in main memory (1)<br>• data and instructions are fetched by the CPU (1)<br>• on the pulse of a clock (1) (as 'required'/ notified / assigned by the program counter)<br>• correctly identify role of address bus (1)<br>• correctly identify role of data bus (1)<br>• instructions decoded by the CU (1)<br>• instructions executed (with data, as appropriate) by the ALU (1)<br><br>Data and instructions are fetched from main memory (1), from addresses requested by the CPU (1) on the address bus (1). (Data and instructions are **sent**) using the data bus (1).<br>(Data and instructions are then) decoded and executed in the CPU (1).<br>Results of operations are **sent back** to the memory (1) on the data bus (1). | Response must cover both main memory and CPU<br><br>Accept CPU for bullets 6 and 7 | **4** |

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(d)</td><td>Indicative content:<br>Both translate source code written in high level programming languages into machine code.
<table>
<tr><th>Compiler</th><th>Interpreter</th></tr>
<tr><td>Produces a single executable file that is portable between machines</td><td>Source code needs special environment to run</td></tr>
<tr><td>Needs to be compiled for a particular architecture</td><td>Can run on any architecture that has the translator/interpreter</td></tr>
<tr><td>Entire source code file is translated at once</td><td>Code is translated line by line</td></tr>
<tr><td>Provides error report at the end of the compilation</td><td>Errors more obvious in sequence</td></tr>
<tr><td>The program source code is not available (so helps protect IP)</td><td>Source code is available</td></tr>
<tr><td>Only has to be translated once (affecting the speed of execution)</td><td>Has to be translated each time therefore (affecting the speed of execution)</td></tr>
<tr><td>Requires two files to be maintained (one for execution and for editing purposes)</td><td>Requires only one file to be maintained</td></tr>
</table></td><td></td><td>6</td></tr>
</table>

| 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><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><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><br>The comparison shows well-developed and sustained lines of reasoning which are clear, coherent and logically structured. |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(a)** | A description to include **four** from a response such as:<br><br>URL is clicked/typed into a web browser address bar (1). The page is requested (by the web browser) (1) so HTML and files are fetched from a web server (1) and the browser collates the page (1), which is then displayed on the monitor (1).<br>OR<br>URL is clicked/typed into a web browser address bar (1). The browser locates the IP address (1) either in cache or using a DNS server (1) and the browser sends a request to the web server with that IP address (1); web server uses HTTP to send back the requested web page (1) and the browser displays the content of the page (1). | Expected answer structure:<br>- Request<br>- Response<br>- Build<br>- Render | **4** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(b)** | A description to include **four** from:<br><br>Finds the midpoint of the list (1), divides/splits the list in two (1) until each list contains one item (1). Compares the first item in each list with the first item in the adjacent list (1) until all have been compared and placed in order (1) and recombined/merged into one list (1). | | **4** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(c)i** | 6 | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(c)ii** | 5 | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(c)iii** | 4 | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(c)iv** | No swaps will have been performed. | Do not accept:<br>The list is sorted. | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(d)** | Any **one** of:<br>• Faster<br>• More efficient<br>• Uses fewer comparisons | | **1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(a)** | An explanation to include **two** from:<br><br>Binary can represent two states (1) because computer circuits use transistors, which can either be on or off (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(b)** | <table><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr></table> Award **one** mark for first two rows being correct<br>Award **both** marks if last row is correct | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(c)** | An explanation such as:<br>A two's complement of an 8-bit number can only represent positive integers up to 127 (1) because the rest of the bit combinations (with the most significant bit as '1') represent negative integers (1) | | **2** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(d)** | Indicative content:<br><br>(Digital) audio quality is represented using binary.<br>A number of bits (referred to as bit-depth) are used to 'describe' each sample.<br>A lossy algorithm will reduce the bit-depth. However, it will improve the experience of users who want to stream/download the published files.<br>It will not use frequency/amplitude masking (as is the case with lossless compression algorithms).<br>Lossless algorithms are more complex so will take longer to run.<br>The quality of the audio file is reduced when using a lossy algorithm and may not be as acceptable to a listener as one that has been compressed using a lossless algorithm.<br>Depending on the level of compression, listeners may not be able to distinguish between the original and compressed file.<br>Lossless algorithms will allow the musician to work on files at a later date at their original quality/sample rate/resolution.<br>Files that have been compressed using a lossless algorithm will take longer to upload and require more storage/cost (and reverse). | | **6** |

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