



## Cambridge International AS & A Level

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COMPUTER SCIENCE

9608/13

Paper 1 Written Paper

October/November 2020

MARK SCHEME

Maximum Mark: 75

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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This document consists of **10** printed pages.

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks										
1	<b>1 mark</b> for each correct utility program	<b>4</b>										
	<table border="1"> <thead> <tr> <th>Task</th> <th>Utility program</th> </tr> </thead> <tbody> <tr> <td>Rearrange the data on a disk so that files are contiguous, and all free space is collected together</td> <td><b>Disk defragmenter</b></td> </tr> <tr> <td>Prepare a disk for initial use</td> <td><b>Disk formatter</b></td> </tr> <tr> <td>Reduce the size of a file</td> <td><b>File compression</b></td> </tr> <tr> <td>Examine the disk to find any bad sectors</td> <td><b>Disk contents analysis / repair</b></td> </tr> </tbody> </table>	Task	Utility program	Rearrange the data on a disk so that files are contiguous, and all free space is collected together	<b>Disk defragmenter</b>	Prepare a disk for initial use	<b>Disk formatter</b>	Reduce the size of a file	<b>File compression</b>	Examine the disk to find any bad sectors	<b>Disk contents analysis / repair</b>	
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Question	Answer	Marks
2	<b>1 mark</b> for each correct line	<b>4</b>

Question	Answer	Marks
3(a)	<b>1 mark</b> per bullet point to <b>max 2</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>To run / test the incomplete program</li> <li>To locate individual errors in the program because the interpreter stops</li> <li>... and allows the programmer to correct errors in real-time</li> <li>To change the program and see the effects of the changes in real-time</li> </ul>	

Question	Answer	Marks
3(b)	<p><b>1 mark</b> per bullet point to <b>max 2</b></p> <ul style="list-style-type: none"> <li>To run / test the program multiple times without re-compiling</li> <li>To produce an executable file</li> <li>... so that it can be distributed without the source code</li> </ul>	<b>2</b>
3(c)	<p><b>1 mark</b> for a benefit, <b>1 mark</b> for a drawback</p> <p>Benefit:</p> <ul style="list-style-type: none"> <li>Programs may be interpreted on different platforms</li> </ul> <p>Drawback:</p> <ul style="list-style-type: none"> <li>Intermediate code / program still needs to be interpreted on the user's computer, which may run slowly</li> <li>Extra CPU resources may be required</li> </ul>	<b>2</b>

Question	Answer	Marks
4(a)(i)	<p><b>1 mark</b> per bullet point</p> <ul style="list-style-type: none"> <li>To identify the laptop on the home network</li> <li>To allow the router to send data to the laptop from the Internet / another device <u>on the home network</u></li> </ul>	<b>2</b>
4(a)(ii)	<p><b>1 mark</b> per bullet point to <b>max 2</b></p> <ul style="list-style-type: none"> <li>The router has the public IP address for the home network</li> <li>All data comes through the router</li> <li>The laptop is not accessible / visible to the outside world</li> <li>... to ensure security // to protect the laptop from external threats</li> </ul>	<b>2</b>
4(a)(iii)	<p><b>1 mark</b> per bullet point to <b>max 3</b></p> <ul style="list-style-type: none"> <li>IPv4 has 4 groups of digits, IPv6 has 8 groups of digits</li> <li>In IPv4 each group is from 0-<u>255</u>, in IPv6 each group is from 0-<u>65535</u></li> <li>IPv4 uses a full-stop between each group, IPv6 uses a colon between each group</li> <li>IPv4 is <u>32-bit</u>, IPv6 is <u>128-bit</u> // IPv4 uses <u>4 bytes</u>, IPv6 uses <u>16 bytes</u></li> </ul>	<b>3</b>
4(b)	<p><b>1 mark</b> for identification, <b>1 mark</b> for further description</p> <ul style="list-style-type: none"> <li>Dedicated lines / leased line services</li> <li>Connection that is only used for that business/organisation // permanent connection</li> <li>Cell phone network</li> <li>Send data to cell towers over mobile connection</li> <li>Satellite</li> <li>Send data to satellites in orbit</li> </ul>	<b>4</b>

Question	Answer	Marks										
4(c)(i)	<p><b>1 mark</b> for each correct description</p> <table border="1" data-bbox="304 315 1326 875"> <thead> <tr> <th data-bbox="304 315 911 380">PHP Code</th> <th data-bbox="911 315 1326 380">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="304 380 911 479"><code>echo "Hello World";</code></td> <td data-bbox="911 380 1326 479">Outputs the string Hello World to the browser</td> </tr> <tr> <td data-bbox="304 479 911 577"><code>\$number1 = 22;</code></td> <td data-bbox="911 479 1326 577">Stores the number 22 in the variable \$number1</td> </tr> <tr> <td data-bbox="304 577 911 710"><code>\$newValue = \$_GET["number"];</code></td> <td data-bbox="911 577 1326 710">Get the value assigned to number and store it in the variable \$newValue</td> </tr> <tr> <td data-bbox="304 710 911 875"><code>print "Hello " . \$name . "&lt;br&gt;;</code></td> <td data-bbox="911 710 1326 875">Output Hello, followed by the value stored in the variable \$name and then force a new line break</td> </tr> </tbody> </table>	PHP Code	Description	<code>echo "Hello World";</code>	Outputs the string Hello World to the browser	<code>\$number1 = 22;</code>	Stores the number 22 in the variable \$number1	<code>\$newValue = \$_GET["number"];</code>	Get the value assigned to number and store it in the variable \$newValue	<code>print "Hello " . \$name . "&lt;br&gt;;</code>	Output Hello, followed by the value stored in the variable \$name and then force a new line break	<b>4</b>
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4(d)	<p><b>1 mark</b> per bullet point to <b>max 2</b></p> <ul style="list-style-type: none"> <li>• Automatically checks for errors on receipt of data</li> <li>• Alerts if data has been received incorrectly // requests data to be re-sent</li> <li>• Provides a verification check on data</li> </ul>	<b>2</b>										

Question	Answer			Marks																				
5(a)(i)	<p><b>1 mark</b> for each correct row</p> <table border="1" data-bbox="304 315 1326 1167"> <thead> <tr> <th data-bbox="304 315 421 376">Letter</th> <th data-bbox="421 315 922 376">Action</th> <th data-bbox="922 315 1326 376">Register transfer notation</th> </tr> </thead> <tbody> <tr> <td data-bbox="304 376 421 622"><b>A</b></td> <td data-bbox="421 376 922 622">The Memory Address Register (MAR) stores an address. The contents of this stored address are copied to the Memory Data Register (MDR).</td> <td data-bbox="922 376 1326 622"><b>MDR ← [[MAR]]</b></td> </tr> <tr> <td data-bbox="304 622 421 801"><b>B</b></td> <td data-bbox="421 622 922 801">The contents of the Program Counter (PC) are copied to the Memory Address Register (MAR).</td> <td data-bbox="922 622 1326 801"><b>MAR ← [PC]</b></td> </tr> <tr> <td data-bbox="304 801 421 981"><b>C</b></td> <td data-bbox="421 801 922 981">The contents of the Memory Data Register (MDR) are copied to the Current Instruction Register (CIR).</td> <td data-bbox="922 801 1326 981"><b>CIR ← [MDR]</b></td> </tr> <tr> <td data-bbox="304 981 421 1167"><b>D</b></td> <td data-bbox="421 981 922 1167">The contents of the Program Counter (PC) are incremented.</td> <td data-bbox="922 981 1326 1167"><b>PC ← [PC] + 1</b></td> </tr> </tbody> </table>			Letter	Action	Register transfer notation	<b>A</b>	The Memory Address Register (MAR) stores an address. The contents of this stored address are copied to the Memory Data Register (MDR).	<b>MDR ← [[MAR]]</b>	<b>B</b>	The contents of the Program Counter (PC) are copied to the Memory Address Register (MAR).	<b>MAR ← [PC]</b>	<b>C</b>	The contents of the Memory Data Register (MDR) are copied to the Current Instruction Register (CIR).	<b>CIR ← [MDR]</b>	<b>D</b>	The contents of the Program Counter (PC) are incremented.	<b>PC ← [PC] + 1</b>	<b>4</b>					
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5(b)	<p><b>1 mark</b> for the first three rows correct <b>1 mark</b> for the last row correct</p> <table border="1" data-bbox="304 1397 1326 1794"> <thead> <tr> <th data-bbox="304 1397 876 1496">Statement</th> <th data-bbox="876 1397 1024 1496">Address bus</th> <th data-bbox="1024 1397 1173 1496">Control bus</th> <th data-bbox="1173 1397 1326 1496">Data bus</th> </tr> </thead> <tbody> <tr> <td data-bbox="304 1496 876 1563">Receives data from the MAR</td> <td data-bbox="876 1496 1024 1563">✓</td> <td data-bbox="1024 1496 1173 1563"></td> <td data-bbox="1173 1496 1326 1563"></td> </tr> <tr> <td data-bbox="304 1563 876 1662">Carries an address or an instruction or a value</td> <td data-bbox="876 1563 1024 1662"></td> <td data-bbox="1024 1563 1173 1662"></td> <td data-bbox="1173 1563 1326 1662">✓</td> </tr> <tr> <td data-bbox="304 1662 876 1729">Transmits timing signals to components</td> <td data-bbox="876 1662 1024 1729"></td> <td data-bbox="1024 1662 1173 1729">✓</td> <td data-bbox="1173 1662 1326 1729"></td> </tr> <tr> <td data-bbox="304 1729 876 1794">Bidirectional</td> <td data-bbox="876 1729 1024 1794"></td> <td data-bbox="1024 1729 1173 1794">✓</td> <td data-bbox="1173 1729 1326 1794">✓</td> </tr> </tbody> </table>			Statement	Address bus	Control bus	Data bus	Receives data from the MAR	✓			Carries an address or an instruction or a value			✓	Transmits timing signals to components		✓		Bidirectional		✓	✓	<b>2</b>
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6(a)	<b>1 mark</b> for each valid point or appropriate expansion to <b>max 2</b>  e.g. <ul style="list-style-type: none"> <li>• Reduce his workload // Review his work demands</li> <li>• Redistribute his work</li> <li>• Arrange a meeting with him</li> <li>• ... to discuss the reasons why he is struggling</li> </ul>	<b>2</b>
6(b)	<b>1 mark</b> for each valid point or appropriate expansion to <b>max 2</b>  e.g. <ul style="list-style-type: none"> <li>• Not acting in best interest of the client</li> <li>• ... The error could cause significant problems for the client if encountered</li> <li>• The product does not meet the highest possible standard</li> <li>• Not acting in the best interest of the development company</li> <li>• ... if the error occurs, it could lead to repercussions for the development company</li> </ul>	<b>2</b>
6(c)(i)	<b>1 mark</b> from <ul style="list-style-type: none"> <li>• Protects the intellectual property</li> <li>• Allows legal action against anyone else who claims it as their own</li> <li>• Formally / Legally identify the client as the owner of the software</li> </ul>	<b>1</b>
6(c)(ii)	<b>1 mark</b> for each correct licence <ul style="list-style-type: none"> <li>• Commercial</li> <li>• Shareware</li> </ul>	<b>2</b>
6(c)(iii)	<b>1 mark</b> for correctly identifying a licence, <b>1 mark</b> for justification <ul style="list-style-type: none"> <li>• Open Source // Free Software</li> <li>• Anyone can modify/copy the source code and re-distribute which is not what the client wants</li> </ul>	<b>2</b>

Question	Answer	Marks
7(a)	1 mark per bullet point to max 4 <ul style="list-style-type: none"> <li>• Each item is a drawing object</li> <li>• Properties of each drawing object are stored</li> <li>• ... an example of a property e.g. the position/coordinates of each drawing object</li> <li>• ... a second example of a property e.g. the line colour</li> <li>• Exact dimensions are not stored // a calculation for proportional size is stored</li> <li>• Objects are created using mathematical calculations</li> </ul>	<b>4</b>



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7(b)(i)	<p><b>1 mark</b> for working <b>1 mark</b> for correct answer</p> <p><b>Working:</b>  <math>1024 \times 2048 = 2\,097\,152</math> pixels  <math>= 2\,097\,152</math> bytes (8 bits per pixel)  <math>= 2\,097\,152 / 1024 = 2048</math> KB  <math>= 2048 / 1024</math> MB</p> <p><b>Answer:</b> 2 MB</p>	<b>2</b>																																													
7(b)(ii)	<p><b>1 mark</b> for identification of method, <b>max 2</b> for description for one method</p> <p>e.g.</p> <ul style="list-style-type: none"> <li>• Reduce the colour depth</li> <li>• ... reduce the number of bits per colour</li> <li>• ... each pixel has fewer bits</li>   <li>• Reducing the resolution</li> <li>• ... fewer pixels per unit measurement</li> <li>• ... fewer pixels / binary numbers are stored</li> </ul>	<b>3</b>																																													
8(a)	<p><b>1 mark</b> for each pair of correct answers (shaded)</p> <table border="1" data-bbox="308 1070 1098 1664"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>Working space</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td></td> <td style="background-color: #cccccc;">1</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td></td> <td style="background-color: #cccccc;">0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td></td> <td style="background-color: #cccccc;">1</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td></td> <td style="background-color: #cccccc;">1</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td></td> <td style="background-color: #cccccc;">0</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td></td> <td style="background-color: #cccccc;">0</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td></td> <td style="background-color: #cccccc;">1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td></td> <td style="background-color: #cccccc;">0</td> </tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		1	0	0	1		0	0	1	0		1	0	1	1		1	1	0	0		0	1	0	1		0	1	1	0		1	1	1	1		0	<b>4</b>
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Question	Answer	Marks																														
8(b)	<p><b>1 mark</b> for correct name, <b>1 mark</b> for corresponding truth table</p> <ul style="list-style-type: none"><li>• NAND</li></ul> <table border="1" data-bbox="308 349 612 678"><thead><tr><th>A</th><th>B</th><th>Output</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></tbody></table> <ul style="list-style-type: none"><li>• XOR</li></ul> <table border="1" data-bbox="308 745 620 1072"><thead><tr><th>A</th><th>B</th><th>Output</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></tbody></table>	A	B	Output	0	0	1	0	1	1	1	0	1	1	1	0	A	B	Output	0	0	0	0	1	1	1	0	1	1	1	0	<b>2</b>
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