



Cambridge International AS & A Level

COMPUTER SCIENCE

9608/13

Paper 1 Written Paper

October/November 2020

MARK SCHEME

Maximum Mark: 75

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.

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	1 mark for each correct utility program	4										
	<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>Disk defragmenter</td> </tr> <tr> <td>Prepare a disk for initial use</td> <td>Disk formatter</td> </tr> <tr> <td>Reduce the size of a file</td> <td>File compression</td> </tr> <tr> <td>Examine the disk to find any bad sectors</td> <td>Disk contents analysis / repair</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	Disk defragmenter	Prepare a disk for initial use	Disk formatter	Reduce the size of a file	File compression	Examine the disk to find any bad sectors	Disk contents analysis / repair	
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Question	Answer	Marks
2	1 mark for each correct line	4

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

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

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

Question	Answer	Marks										
4(c)(i)	<p>1 mark 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">echo "Hello World";</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">\$number1 = 22;</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">\$newValue = \$_GET["number"];</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">print "Hello " . \$name . "
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4(c)(ii)	<p>1 mark for a correct answer</p> <ul data-bbox="304 976 501 1010" style="list-style-type: none"> • Javascript 	1										
4(d)	<p>1 mark per bullet point to max 2</p> <ul data-bbox="304 1115 1310 1214" style="list-style-type: none"> • Automatically checks for errors on receipt of data • Alerts if data has been received incorrectly // requests data to be re-sent • Provides a verification check on data 	2										

Question	Answer	Marks																				
5(a)(i)	<p>1 mark for each correct row</p> <table border="1"> <thead> <tr> <th>Letter</th> <th>Action</th> <th>Register transfer notation</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>The Memory Address Register (MAR) stores an address. The contents of this stored address are copied to the Memory Data Register (MDR).</td> <td>MDR ← [[MAR]]</td> </tr> <tr> <td>B</td> <td>The contents of the Program Counter (PC) are copied to the Memory Address Register (MAR).</td> <td>MAR ← [PC]</td> </tr> <tr> <td>C</td> <td>The contents of the Memory Data Register (MDR) are copied to the Current Instruction Register (CIR).</td> <td>CIR ← [MDR]</td> </tr> <tr> <td>D</td> <td>The contents of the Program Counter (PC) are incremented.</td> <td>PC ← [PC] + 1</td> </tr> </tbody> </table>	Letter	Action	Register transfer notation	A	The Memory Address Register (MAR) stores an address. The contents of this stored address are copied to the Memory Data Register (MDR).	MDR ← [[MAR]]	B	The contents of the Program Counter (PC) are copied to the Memory Address Register (MAR).	MAR ← [PC]	C	The contents of the Memory Data Register (MDR) are copied to the Current Instruction Register (CIR).	CIR ← [MDR]	D	The contents of the Program Counter (PC) are incremented.	PC ← [PC] + 1	4					
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5(a)(ii)	<p>1 mark for B, A, C in order</p> <p>1 mark for D at any point after B</p>	2																				
5(b)	<p>1 mark for the first three rows correct 1 mark for the last row correct</p> <table border="1"> <thead> <tr> <th>Statement</th> <th>Address bus</th> <th>Control bus</th> <th>Data bus</th> </tr> </thead> <tbody> <tr> <td>Receives data from the MAR</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Carries an address or an instruction or a value</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Transmits timing signals to components</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Bidirectional</td> <td></td> <td>✓</td> <td>✓</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		✓	✓	2
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5(c)(ii)	<p>1 mark for each correct shaded section</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Instruction address</th> <th rowspan="2">ACC</th> <th colspan="4">Memory address</th> </tr> <tr> <th>900</th> <th>901</th> <th>902</th> <th>903</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td>0</td> </tr> <tr> <td>500</td> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>501</td> <td></td> <td></td> <td>2</td> <td></td> <td></td> </tr> <tr> <td>502</td> <td>10</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>503</td> <td></td> <td>10</td> <td></td> <td></td> <td></td> </tr> <tr> <td>504</td> <td>10</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>505</td> <td></td> <td></td> <td></td> <td>10</td> <td></td> </tr> <tr> <td>506</td> <td>0</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>507</td> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>508</td> <td></td> <td></td> <td></td> <td></td> <td>1</td> </tr> <tr> <td>509</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>510</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>502</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>503</td> <td></td> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>504</td> <td>13</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>505</td> <td></td> <td></td> <td></td> <td>13</td> <td></td> </tr> <tr> <td>506</td> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>507</td> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>508</td> <td></td> <td></td> <td></td> <td></td> <td>2</td> </tr> <tr> <td>509</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>511</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Instruction address	ACC	Memory address				900	901	902	903					0	0	500	2					501			2			502	10					503		10				504	10					505				10		506	0					507	1					508					1	509						510						502	3					503		3				504	13					505				13		506	1					507	2					508					2	509						511						6
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6(a)	1 mark for each valid point or appropriate expansion to max 2 e.g. <ul style="list-style-type: none"> • Reduce his workload // Review his work demands • Redistribute his work • Arrange a meeting with him • ... to discuss the reasons why he is struggling 	2
6(b)	1 mark for each valid point or appropriate expansion to max 2 e.g. <ul style="list-style-type: none"> • Not acting in best interest of the client • ... The error could cause significant problems for the client if encountered • The product does not meet the highest possible standard • Not acting in the best interest of the development company • ... if the error occurs, it could lead to repercussions for the development company 	2
6(c)(i)	1 mark from <ul style="list-style-type: none"> • Protects the intellectual property • Allows legal action against anyone else who claims it as their own • Formally / Legally identify the client as the owner of the software 	1
6(c)(ii)	1 mark for each correct licence <ul style="list-style-type: none"> • Commercial • Shareware 	2
6(c)(iii)	1 mark for correctly identifying a licence, 1 mark for justification <ul style="list-style-type: none"> • Open Source // Free Software • Anyone can modify/copy the source code and re-distribute which is not what the client wants 	2

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

Question	Answer	Marks																																													
7(b)(i)	<p>1 mark for working 1 mark for correct answer</p> <p>Working: $1024 \times 2048 = 2\,097\,152$ pixels $= 2\,097\,152$ bytes (8 bits per pixel) $= 2\,097\,152 / 1024 = 2048$ KB $= 2048 / 1024$ MB</p> <p>Answer: 2 MB</p>	2																																													
7(b)(ii)	<p>1 mark for identification of method, max 2 for description for one method</p> <p>e.g.</p> <ul style="list-style-type: none"> • Reduce the colour depth • ... reduce the number of bits per colour • ... each pixel has fewer bits • Reducing the resolution • ... fewer pixels per unit measurement • ... fewer pixels / binary numbers are stored 	3																																													
8(a)	<p>1 mark for each pair of correct answers (shaded)</p> <table border="1" data-bbox="308 1070 1098 1662"> <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	4
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8(b)	<p data-bbox="308 248 1114 282">1 mark for correct name, 1 mark for corresponding truth table</p> <ul data-bbox="308 322 448 349" style="list-style-type: none"><li data-bbox="308 322 448 349">• NAND <table border="1" data-bbox="308 349 611 678"><thead><tr><th data-bbox="308 349 384 409">A</th><th data-bbox="384 349 461 409">B</th><th data-bbox="461 349 611 409">Output</th></tr></thead><tbody><tr><td data-bbox="308 409 384 470">0</td><td data-bbox="384 409 461 470">0</td><td data-bbox="461 409 611 470">1</td></tr><tr><td data-bbox="308 470 384 530">0</td><td data-bbox="384 470 461 530">1</td><td data-bbox="461 470 611 530">1</td></tr><tr><td data-bbox="308 530 384 591">1</td><td data-bbox="384 530 461 591">0</td><td data-bbox="461 530 611 591">1</td></tr><tr><td data-bbox="308 591 384 651">1</td><td data-bbox="384 591 461 651">1</td><td data-bbox="461 591 611 651">0</td></tr></tbody></table> <ul data-bbox="308 719 432 745" style="list-style-type: none"><li data-bbox="308 719 432 745">• XOR <table border="1" data-bbox="308 745 611 1072"><thead><tr><th data-bbox="308 745 384 806">A</th><th data-bbox="384 745 461 806">B</th><th data-bbox="461 745 611 806">Output</th></tr></thead><tbody><tr><td data-bbox="308 806 384 866">0</td><td data-bbox="384 806 461 866">0</td><td data-bbox="461 806 611 866">0</td></tr><tr><td data-bbox="308 866 384 927">0</td><td data-bbox="384 866 461 927">1</td><td data-bbox="461 866 611 927">1</td></tr><tr><td data-bbox="308 927 384 987">1</td><td data-bbox="384 927 461 987">0</td><td data-bbox="461 927 611 987">1</td></tr><tr><td data-bbox="308 987 384 1048">1</td><td data-bbox="384 987 461 1048">1</td><td data-bbox="461 987 611 1048">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	2
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