



Cambridge International AS & A Level

COMPUTER SCIENCE

9618/12

Paper 1 Theory Fundamentals

May/June 2021

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 May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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:

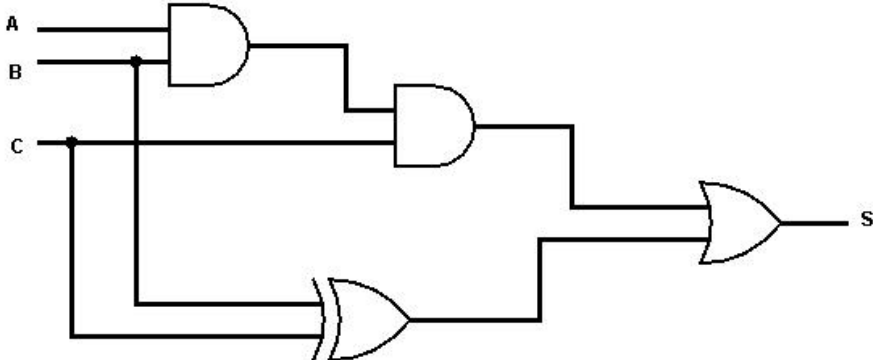
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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(a)	<p>1 mark for definition, 1 mark for appropriate example in each</p> <table border="1" data-bbox="308 331 1326 696"> <thead> <tr> <th data-bbox="308 331 475 392">Term</th> <th data-bbox="475 331 1326 392">Definition and example</th> </tr> </thead> <tbody> <tr> <td data-bbox="308 392 475 497">Field</td> <td data-bbox="475 392 1326 497">A column/attribute in a table e.g. CustomerID in the table CUSTOMER</td> </tr> <tr> <td data-bbox="308 497 475 602">Entity</td> <td data-bbox="475 497 1326 602">Anything that data can be stored about e.g. A customer or a house</td> </tr> <tr> <td data-bbox="308 602 475 696">Foreign Key</td> <td data-bbox="475 602 1326 696">A field in one table that is linked to a Primary Key in another table e.g. CustomerID / HouseID <u>in table RENTAL</u></td> </tr> </tbody> </table>	Term	Definition and example	Field	A column/attribute in a table e.g. CustomerID in the table CUSTOMER	Entity	Anything that data can be stored about e.g. A customer or a house	Foreign Key	A field in one table that is linked to a Primary Key in another table e.g. CustomerID / HouseID <u>in table RENTAL</u>	6
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1(b)	<p>1 mark per bullet point to max 2</p> <ul style="list-style-type: none"> • All fields in all tables are dependant fully on the PK and on no other fields • for example all fields in Customer table are fully dependent on CustomerID 	2								
1(c)(i)	<p>1 mark for each correctly completed line</p> <pre>CREATE TABLE RENTAL (RentalID INTEGER NOT NULL, CustomerID INTEGER NOT NULL, HouseID VARCHAR (5) NOT NULL, MonthlyCost REAL/CURRENCY NOT NULL, DepositPaid BOOLEAN NOT NULL, PRIMARY KEY (RentalID));</pre>	4								
1(c)(ii)	<p>1 mark per bullet point</p> <ul style="list-style-type: none"> • Select FirstName and LastName • From both tables • Where DepositPaid = No • Joining tables (either AND, or INNER JOIN) <p>Example script:</p> <pre>SELECT FirstName, LastName FROM CUSTOMER, RENTAL WHERE DepositPaid = No AND RENTAL.CustomerID = CUSTOMER.CustomerID;</pre>	4								

Question	Answer	Marks																									
2(a)	<p>1 mark per bullet point to max 2</p> <ul style="list-style-type: none"> • To make sure the team members feel valued • To get the best work out of the team • To enable them to work well together • To enable them to create the best product for the client 	2																									
2(b)	<p>1 mark per bullet point to max 3</p> <ul style="list-style-type: none"> • The rules / past moves / decision making algorithms of the game will be stored • The AI program is trained, by playing many times • AI will look (ahead) at possible moves • ... and/or analyse the pattern of past choices • ... and choose the move most likely to be successful • Computer could learn how to improve // learn from previous mistakes • ... by storing the positive/negative result of choices • ... and changing its future choices 	3																									
2(c)	<p>1 mark for each correct column</p> <table border="1" data-bbox="304 972 1326 1599"> <thead> <tr> <th data-bbox="304 972 603 1104">Statement</th> <th data-bbox="603 972 793 1104">Free Software Foundation</th> <th data-bbox="793 972 946 1104">Open Source Initiative</th> <th data-bbox="946 972 1128 1104">Shareware</th> <th data-bbox="1128 972 1326 1104">Commercial Software</th> </tr> </thead> <tbody> <tr> <td data-bbox="304 1104 603 1205">The user can edit the source code</td> <td data-bbox="603 1104 793 1205" style="text-align: center;">✓</td> <td data-bbox="793 1104 946 1205" style="text-align: center;">✓</td> <td data-bbox="946 1104 1128 1205"></td> <td data-bbox="1128 1104 1326 1205"></td> </tr> <tr> <td data-bbox="304 1205 603 1368">The user must always pay before being able to use the software</td> <td data-bbox="603 1205 793 1368"></td> <td data-bbox="793 1205 946 1368"></td> <td data-bbox="946 1205 1128 1368"></td> <td data-bbox="1128 1205 1326 1368" style="text-align: center;">✓</td> </tr> <tr> <td data-bbox="304 1368 603 1500">The user can redistribute the software</td> <td data-bbox="603 1368 793 1500" style="text-align: center;">✓</td> <td data-bbox="793 1368 946 1500" style="text-align: center;">✓</td> <td data-bbox="946 1368 1128 1500" style="text-align: center;">✓</td> <td data-bbox="1128 1368 1326 1500"></td> </tr> <tr> <td data-bbox="304 1500 603 1599">The user always gets a trial period</td> <td data-bbox="603 1500 793 1599"></td> <td data-bbox="793 1500 946 1599"></td> <td data-bbox="946 1500 1128 1599" style="text-align: center;">✓</td> <td data-bbox="1128 1500 1326 1599"></td> </tr> </tbody> </table>	Statement	Free Software Foundation	Open Source Initiative	Shareware	Commercial Software	The user can edit the source code	✓	✓			The user must always pay before being able to use the software				✓	The user can redistribute the software	✓	✓	✓		The user always gets a trial period			✓		4
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3(a)	<p>1 mark for each correct gate, with correct inputs</p> 	4																																													
3(b)	<p>1 mark for each half (shaded)</p> <table border="1" data-bbox="308 786 1011 1368"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>Working space</th> <th>S</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td></td> <td style="background-color: #cccccc;">0</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td></td> <td style="background-color: #cccccc;">1</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;">0</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;">1</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;">1</td> </tr> </tbody> </table>	A	B	C	Working space	S	0	0	0		0	0	0	1		1	0	1	0		1	0	1	1		0	1	0	0		0	1	0	1		1	1	1	0		1	1	1	1		1	2
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4(a)	<p>1 mark for each shaded section / bullet point</p> <ul style="list-style-type: none"> • Load 65 into ACC • Load 100 into ACC, increment and store in 102 • Load 68 into ACC • Load 101 into ACC, decrement and store in 102 <table border="1" data-bbox="304 490 1018 1825"> <thead> <tr> <th data-bbox="304 490 496 622" rowspan="2">Instruction address</th> <th data-bbox="496 490 639 622" rowspan="2">ACC</th> <th colspan="3" data-bbox="639 490 1018 555">Memory address</th> </tr> <tr> <th data-bbox="639 555 762 622">100</th> <th data-bbox="762 555 874 622">101</th> <th data-bbox="874 555 1018 622">102</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>68</td> <td>65</td> <td>100</td> </tr> <tr> <td>70</td> <td>65</td> <td></td> <td></td> <td></td> </tr> <tr> <td>71</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>72</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>73</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>74</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>76</td> <td>100</td> <td></td> <td></td> <td></td> </tr> <tr> <td>77</td> <td>101</td> <td></td> <td></td> <td></td> </tr> <tr> <td>78</td> <td></td> <td></td> <td></td> <td>101</td> </tr> <tr> <td>79</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>70</td> <td>68</td> <td></td> <td></td> <td></td> </tr> <tr> <td>71</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>72</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>80</td> <td>101</td> <td></td> <td></td> <td></td> </tr> <tr> <td>81</td> <td>100</td> <td></td> <td></td> <td></td> </tr> <tr> <td>82</td> <td></td> <td></td> <td></td> <td>100</td> </tr> <tr> <td>83</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(70)</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Instruction address	ACC	Memory address			100	101	102			68	65	100	70	65				71					72					73					74					76	100				77	101				78				101	79					70	68				71					72					80	101				81	100				82				100	83					(70)					4
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Question	Answer	Marks
4(b)(iii)	1 mark for AND, 1 mark for #15 AND #15	2

Question	Answer	Marks
5(a)	1 mark for each term correctly inserted The control unit/bus transmits the signals to coordinate events based on the pulses of the (system) clock . The data bus carries data to components, while the address bus carries the address where data is being written to or read from. The arithmetic logic unit/ALU performs mathematical operations and logical comparisons.	5
5(b)	1 mark per bullet point to max 3 per factor. max 4 overall. Number of cores: <ul style="list-style-type: none"> • Each core processes one <u>instruction</u> per clock pulse • More/multiple cores mean that sequences of instructions can be split between them • ... and so more than one <u>instruction</u> is executed per clock pulse // more sequences of instructions can be run at the same time • More cores decreases the time taken to complete task Clock speed: <ul style="list-style-type: none"> • Each <u>instruction</u> is executed on a clock pulse // one F-E cycle is run on each clock pulse • ... so the clock speed dictates the number of <u>instructions</u> that can be run per second • The faster the clock speed the more <u>instructions</u> can be run per second 	4
5(c)(i)	1 mark per bullet point to max 2 <ul style="list-style-type: none"> • Cloud storage can be free (for small quantities) • No need for separate (high capacity) storage devices // saves storage on existing devices • Can access data from any computer with internet access • Most cloud data services will have in-built backup/disaster recovery • Security could be better • Can easily increase capacity • Data can be easily shared 	2

Question	Answer	Marks														
5(c)(ii)	<p>1 mark per bullet point to max 2:</p> <ul style="list-style-type: none"> • Can only access (the cloud) with internet access • Security may not be strong // no control over security • There may not be any backups // no control over backups • It can take a long time to upload/download the data • It can be more expensive in the long term • There could be a limit to the amount of storage unless paid for • There could be compatibility/access issues • There could be issues with the company offering cloud services 	2														
5(d)	<p>1 mark for each correct line</p> <table border="1"> <thead> <tr> <th>Term</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Public IP Address</td> <td>It is only visible to devices within the Local Area Network (LAN)</td> </tr> <tr> <td>Private IP address</td> <td>It increments by 1 each time the device connects to the internet</td> </tr> <tr> <td>Dynamic IP address</td> <td>A new one is reallocated each time a device connects to the internet</td> </tr> <tr> <td>Static IP address</td> <td>It can only be allocated to a router</td> </tr> <tr> <td></td> <td>It is visible to any device on the internet</td> </tr> <tr> <td></td> <td>It does not change each time a device is connected to the internet</td> </tr> </tbody> </table>	Term	Description	Public IP Address	It is only visible to devices within the Local Area Network (LAN)	Private IP address	It increments by 1 each time the device connects to the internet	Dynamic IP address	A new one is reallocated each time a device connects to the internet	Static IP address	It can only be allocated to a router		It is visible to any device on the internet		It does not change each time a device is connected to the internet	4
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Question	Answer	Marks
6(a)	<p>1 mark for each correct answer</p> <p>ASCII = 128 // 2^7</p> <p>Extended ASCII = 256 // 2^8</p>	2
6(b)	<p>1 mark per bullet point to max 2</p> <ul style="list-style-type: none"> • Each character has its own unique code • Each character in the word is replaced by its code • The codes are stored in the order in the word 	2

Question	Answer	Marks
6(c)(i)	31	1
6(c)(ii)	53	1

Question	Answer	Marks
7(a)	1 mark per bullet point to max 2 <ul style="list-style-type: none"> • Program libraries store pre-written functions and routines • The program library can be referenced/imported • the functions/routines can be called in her own program 	2
7(b)(i)	1 mark per bullet point to max 4; max 3 from each section Interpreter: <ul style="list-style-type: none"> • Use an interpreter while writing the program • ... to test/debug the partially completed program • ... because errors can be corrected and processing continue from where the execution stopped // errors can be corrected in real time // errors are identified one at a time Compiler: <ul style="list-style-type: none"> • Use the compiler after the program is complete • ... to create an executable file • Use the compiler to repeatedly test the same (completed) section • ... without having to re-interpret every time // compiler not needed at run-time 	4
7(b)(ii)	1 mark per correct tool to max 2 e.g. <ul style="list-style-type: none"> • Breakpoints • Single stepping • Report windows 	2

Question	Answer	Marks
8(a)	1 mark per bullet point <ul style="list-style-type: none"> • Security protects data against loss • Privacy protects data against unauthorised access 	2
8(b)	1 mark for a correct answer <ul style="list-style-type: none"> • Two factor authentication • Biometric passwords • Key Card Access • Firewall 	1

Question	Answer	Marks
8(c)	1 mark per correct answer to max 2 <ul style="list-style-type: none">• Malware // viruses // spyware // by example• Hacking• Phishing• Pharming	2