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Mark Scheme

Sample Assessment Material II

GCSE Computer Science (1CP0/01)
Paper 1: Principles of Computer Science

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.

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	8		**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	2^8 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 2^4 x 2^4	Do not award the single number 256; the question asks for an expression.	**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	1024, 2^{10} 1024 x 1024, 1024^2, 1048576, 2^{20}		**2**

Question Number	Answer	Additional Guidance	Mark
1(a)(iv)	$\frac{1024\ bytes}{KB} \times \frac{1024\ KB}{MB} \times \frac{1024\ \text{MB}}{\text{GB}}$ 1024 x 1024 x 1024 1024^3 2^{10} x 2^{10} x 2^{10} 2^{30} $(2^{10})^3$ Other correct mathematical expressions should be awarded		**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(v)	Instructions		**1**

Question Number	Answer	Additional Guidance	Mark
1(b) (i)	78		**1**

Question Number	Answer	Additional Guidance	Mark
1(b) (ii)	Answer must be given to 8-bits One mark for each correct 4-bits (nibble) 0011 1111 3 = 0011 F = 1111		**2**

Question Number	Answer	Additional Guidance	Mark
1(b) (iii)	As a shorthand for binary Easier for humans to read than binary Shorter visual representation than binary	Do not award any indication of memory usage, such as "takes less memory" Do not accept "easier" or "better" without expansion.	**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	Bits per second		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	1		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	Any two of: • HTTP is **not secure** and/or **not encrypted** so anyone who captures the data can easily read it. • HTTPS is **secure** and/or **encrypted**. • No one can **decrypt**/unscramble/decipher information sent over HTTPS, **unless they have the correct key**. • No **unauthorised** person can **decrypt** the data.	Note: "No one can read/decrypt the data" is not enough to award mark.	**2**

Question Number	Answer	Additional Guidance	Mark
1(c)(iv)	Encryption		**1**

Question Number	Answer	Additional Guidance	Mark
1(d)			**4**

TCP/IP	X
Caesar cipher	X
Spreadsheet application	
Word processor	
Programming language	X
Web browser	
Flowchart	X
Phone app	

(Total for Question 1 = 19 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	Any two from: • Sharing Internet connection • Share peripherals (printer, scanner, speakers, …) • Cost savings by sharing hardware/software • Share data (files, database, …) • Transfer files between computers • Collaboration on projects • Communicating (email, instant messaging, chat, …) • Data can be backed up from one location • Network login to control access to all machines on network • Software installed to individual machines from a central location • Monitor usage of hardware/software • Monitor behaviours of users	Do not accept “faster”, “easier”, “cheaper” and “better” without expansion. Other responses awarded, as long they’re distinct and not duplicates	**2**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	An example from any two of the following rows: • copper cable, twisted-pair, co-axial cable or mains network (networking over mains power line in building) • fibre optic cable • wireless, infrared or microwave	Do not award copper cable, twisted-pair, co-axial cable, mains network as separate marks. Do not award wireless, infrared or microwave as separate marks.	2

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)			4

Characteristic	Ring	Mesh	Star	Bus
A device, such as a switch, sits at the centre			x	
Nodes cooperate to take turns sending data	x			
Performance degrades quickly under heavy loads				x
May have a dedicated connection between each node and every other node		x		

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	Any one of: • To allow connected machines to communicate • To provide the rules of communication between two networked devices		**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	Any two of: • MAC addresses provide a **permanent physical** identification of each device on a network • MAC addresses are **unique** for **each device** • MAC address are **assigned at manufacture** • MAC addresses **never change** • MAC addresses work at the **hardware level** • MAC addresses work at the **data link layer** (level 2) of the OSI model	Do not award responses describing format, which is illustrated in the question.	**2**

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	Any two of: • IP address identifies a device on a network • IP addresses may be **static or dynamic** • IP addresses **may change** on each reconnection to a network • Dynamic IP addresses **are assigned when connecting to a network** • Usually are mapped to domain names like "www.google.co.uk" • IP addresses work at the **network level** (level 3) of the OSI model • IP addresses provide a way to represent **hierarchical organisations of machines**	Do not award responses describing format, which is illustrated in the question.	**2**

Question Number	Answer	Additional Guidance	Mark
2(c)	Any one of • input/output • resource allocation • process management • network management • user management	Accept reasonable answers which relate to any of the bullet points.	1

Question Number	Answer	Additional Guidance	Mark
2(d)	<table><tr><th></th><th>Interpreter</th><th>Compiler</th></tr><tr><td>Translates one source line at a time and executes it</td><td>X</td><td></td></tr><tr><td>The resulting executable file can be run without the need for additional software</td><td></td><td>X</td></tr><tr><td>Translates the entire file of source at one time to create a module</td><td></td><td>X</td></tr><tr><td>Needs a special environment in which to run the source code</td><td>X</td><td></td></tr></table>		4

(Total for Question 2 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	B – Actuators		**1**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	D - Sensors		**1**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	Any one of: • Computer Misuse Act • Data Protection Act		**1**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	One mark for each row; Max four marks 2.9 | 6.7 | 1.1 | 4.2 1.1 | 6.7 | 2.9 | 4.2 | 2.9 | 6.7 | 4.2 | | 4.2 | 6.7 | | | 6.7	Ignore entries to left of diagonal	**4**

Question Number	Answer	Additional Guidance	Mark
3(c)	One mark for each of: • Indication of 2 tables (SELECT, FROM) • Indication of field equivalence "SectionID = Section" (JOIN, WHERE) • Indication of ordering (ORDER BY) Examples (not syntactically correct): SELECT (SectionName) FROM tblSection (RideName, Thrill) FROM tblRide WHERE SectionID = Section ORDER BY SectionName; SELECT (SectionName, RideName, Thrill) FROM tblSection, tblRide, WHERE SectionID = Section ORDER BY SectionName; SELECT (SectionName, RideName, Thrill) FROM tblSection, tblRide, WHERE tblSection.SectionID = tblRide.Section ORDER BY SectionName; SELECT SectionName, tblRide.RideName, tblRide.Thrill FROM tblSection JOIN SectionID=tblRide.Section ORDER BY SectionName; SELECT [tblSection].SectionName, [tblRide].RideName, [tblRide].Thrill FROM tblSection INNER JOIN tblRide ON [tblSection].SectionID=[tblRide].Section	Join is not required but awardable. Without join, then WHERE clause is needed. Ignore syntax errors	**3**

	ORDER BY [tblSection].SectionName;		

Question Number	Answer	Additional Guidance	Mark

3(d)	One mark for:
	• ".date" or any discernable notation indicating link to "class=" tag in HTML
	• "float", "align" or any discernable notation with an argument of "right" or "position" with static arguments for placement (top, right)
	
	Syntatically correct examples:
	`.date {position:fixed;`
	`top:80px;`
	`right:5px;`
	`}`
	`.date {float:right;}`
	`.date {text-align:right;}`
		"date" alone is not enough, without linking notation
		
		Ignore other syntax errors
		
		Do not award any HTML responses, even if they are correct.
			2

Question Number	Answer	Additional Guidance	Mark
3(e)	• Computers use qubits (quantum bits) • Implemented in hardware using quantum states of a physical particle such as the spinning direction of atoms, electrons, or magnetic fields • Qubits can be 1, 0, anything between, or both simultaneously (superposition) • Current materials need super cooling for implementing quantum computing • Can be used to perform millions of calculations in parallel • Have the potential to massively speed up processing in computers • Are very expensive because of the hardware needed • Suitable applications in security, vision recognition, and medical diagnosis • May be used to solve problems not considered solvable by current computers (intractable) • Could development costs be better spent? • May lead to current encryption algorithms being easily broken Quality of Written Communication • 1-2: One or two basic points from above; Technical terminology may not be used correctly; May be high-level using everyday terms; Spelling, grammar, and punctuation errors hinder meaning. • 3-4: Three or more relevant points from above; Some technical terminology used appropriately; Spelling, grammar, and punctuation errors occur, but do not hinder meaning. • 5-6: Four or more relevant points from above; Technical terminology used appropriately and consistently; Spelling, grammar, and punctuation are		**6**

	used accurately and meaning is clear. **Example:** In quantum computers the bits can be 1 and 0 at the same time. It's very expensive to make one. (One point; Lack of technical terminology; QWC ok; 2 marks max) **Example:** Quantum computers use qubits, which can be 1 and 0 at the same time. They are very fast, so in the future our computers will be much quicker. (Three points; Technical terminology acceptable; QWC ok; 4 marks max) **Example:** Quantum computers use qubits, which can be 1 and 0 at the same time. This speeds up the number of instructions done per second. These computers need super cooling to work, so they're very expensive to produce right now. Because they're so fast it means they could be used to solve problems that take a long time like cracking some encryption codes. (Five points; Technical terminology appropriate; QWC ok; 6 marks max) **Example**: Quantum computing • Uses qubits • Can be 1 and 0 at the same time • Are very fast (Two points; Some technical terminology ; QWC unmarkable; 2 marks max)		

(Total for Question 3 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	Any two of: • Populations are represented by many individuals. • Individuals can be programmed with a simple set of rules. • In the real world, most individual organisms behave according to internal rules, not in conjunction with other individuals • Individual interactions based on the rules generate whole system/colony behaviours. • Changing the rules results in different behaviours, which may lead to new understanding. • Understanding of behaviours may be applied in new and different contexts • Swarm behaviours are simulated with this technique. • Individuals cooperate to achieve a result • Individuals coordinate activities to achieve a result	Award any other correct and appropriate response	**2**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	Virtual Machine		**1**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	Any four of: • Uses a mantissa/fractional/significand part • Uses an exponent part • Uses exponent to shift decimal to correct place in mantissa/fraction/significand • Binary digits of 1 on right of decimal (fractional part) represents ½, ¼, … • Binary digits of 1 on left of decimal represents 1, 2, 4, 8, … • Ones on each side of decimal are summed to get a value		**4**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	Analogue		**1**

Question Number	Answer	Additional Guidance	Mark
4(b)(iii)	Any three of: • The height/amplitude of the signal is measured. • The sampling/measuring takes place at given times/intervals. • The sampled value is saved. • This sampling and saving continues along the whole signal. • The more frequent the samples, the more true the digital representation is to the original analogue signal. • The sampled values are a stepped representation of the original analogue curve.		**3**

Question Number	Answer	Additional Guidance	Mark
4(b)(iv)	Lossy		**1**

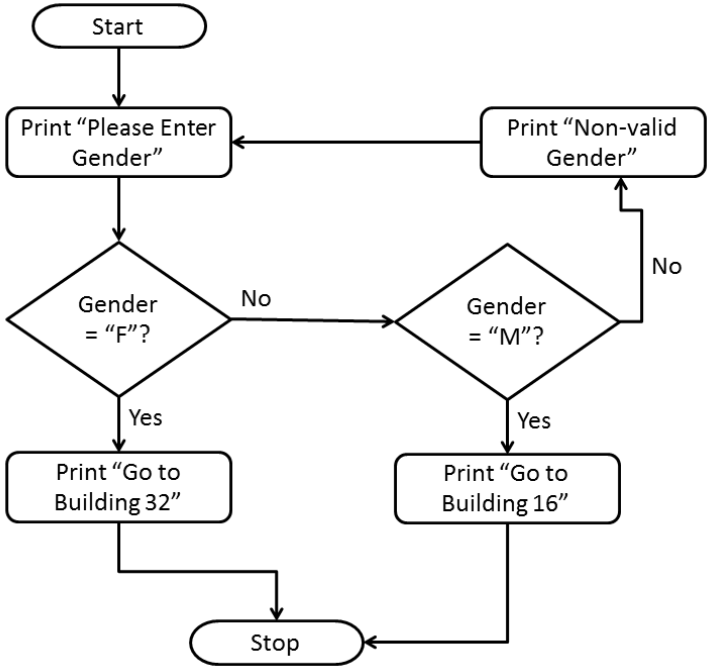
Question Number	Answer	Additional Guidance	Mark
4(b)(v)	Intellectual property (IP)	Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
4(c)	Any four of: • Phone can be located if reported stolen • Parents can track where their children are • Convicted law breakers can be tracked • Dementia patients can be located if they wander from home • Employees could track movement of employees, like delivery drivers • Emergency services can find you, even if you can't talk on the phone • Movements tied to other systems such as transport to be used as input to traffic control algorithms • Can be offered services/information relevant to location • Data may be collected and stored • Use of information may be seen as an invasion of privacy • Is it ethical to track vulnerable people (children, dementia)? • Is it ethical to track law breakers (sex offenders, parolees)? • Who should be allowed access to the collected position data? • Could law enforcement be granted automatic access or should they need a court order? • Employees, with a mobile phone, would still be tracked even when they weren't working for the company (evenings, holidays)	Any other appropriate advantage is awardable. Any other appropriate concern alluding to ethics or privacy.	**4**

(Total for Question 4 = 17 marks)

Question Number	Answer	Additional Guidance	Mark
5(a)	Any two of: • Easy to search using queries • Easy to create reports • Easy to amend/correct/delete entries • Easy to keep data backed up and secure • Keep organised	Do not award sorting as it is in the question.	**2**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	Input (any one of): • Gender of the cat • Male, Female, M, F Output (any one of): • Building number • 16, 32, building 16, building 32 • Error message		**2**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	One mark for each of: • Start symbol and one flow arrow in correct direction • Decision diamond with Gender=F, Yes/No labels, Yes=Bldg 32 • Decision diamond with Gender=M, Yes/No labels, Yes=Bldg 16 • Error message indicating non-valid entry, reconnection to original print/start • Stop symbol and appropriate flow arrow(s) in correct direction 	• Must have correct decision symbol (diamond) • Must have correct start and stop symbol (oval) • Decisions may be in a different order • Do not penalise use of additional symbols (correct or incorrect)	**5**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(c)</td><td>One mark for each type of check (max 2 marks)
One mark for matching test data (max 2 marks)

<table>
<tr><th>Type of Check</th><th>Test Data</th></tr>
<tr><td>Presence Check</td><td>Leave telephone number blank; Test data = “” or “ “</td></tr>
<tr><td>Length Check</td><td>01234567, 0234567890123456789, too short or too long, but all digits</td></tr>
<tr><td>Type Check</td><td>PhoneNumXYZ, all characters, mix of alphabetic characters of correct length</td></tr>
<tr><td>Format Check</td><td>61234567890, Z1234567890, first character not a digit; anything that violates the 0nnnnnnnnn pattern</td></tr>
<tr><td>Range Check</td><td>Telephone numbers of this length with leading 0, should be stored as strings
Usually only acceptable for number inputs
Award only if test data is identified as string with quotes
>"00000000000" And <="09999999999"</td></tr>
</table>

Other correct and appropriate combinations should be awarded.</td><td>• Data supplied must fit test and only that test.
• For example, type check data of “abcd” might also fail the length check, so cannot be awarded.
• If test data does not match identified check, then award type of check only.
• Any suitable term in the type column should be awarded.
• Each condition must be distinct.
• Lookup is not valid for a phone number</td><td>4</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(d)(i)</td><td>One mark for each of:
• weight, teeth, eyes, ears initialised to 5
• ht, he, hr, hw, total initialised to 0; health initialised to 0 or 0.0
• ht, he, hr, hw set to 150, 150, 50, 250 as result of multiplication
• total set to 600 as result of addition
• health set to 6.0 as result of division; must be real number; 6 is not awardable

<table>
<tr><th>weight</th><th>teeth</th><th>eyes</th><th>ears</th><th>ht</th><th>he</th><th>hr</th><th>hw</th><th>total</th><th>health</th></tr>
<tr><td>5</td><td>5</td><td>5</td><td>5</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.0 or 0</td></tr>
<tr><td></td><td></td><td></td><td></td><td>150</td><td>150</td><td>50</td><td>250</td><td>600</td><td>6.0</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td><td></td><td>5</td></tr>
</table>

(Total for Question 5 = 18 marks)

Content Mapping Grid

Question	Specification	Marks
1a(i)	3.3.1	1
1a(ii)	3.2.4	1
1a(iii)	3.3.1	2
1a(iv)	3.3.1	1
1a(v)	3.1.1	1
1b(i)	3.2.1	1
1b(ii)	3.1.5	2
1b(iii)	3.1.5	1
1c(i)	5.1.4	1
1c(ii)	5.1.7	1
1c(iii)	5.2.2	2
1c(iv)	3.4.1	1
1d	4.4.2	4
2a(i)	5.1.1	2
2a(ii)	5.1.3	2
2a(iii)	5.1.9	4
2b(i)	5.1.5	1
2b(ii)	5.1.8	2
2b(iii)	5.2.1	2
2c	4.4.1	1
2d	4.5.2	4

Question	Specification	Marks
3a(i)	4.2.5	1
3a(ii)	4.2.5	1
3b(i)	6.1.3	1
3b(ii)	1.1.8	4
3c	3.5.3	3
3d	5.2.3	2
3e	6.1.1	6
4a(i)	4.1.2	2
4a(ii)	4.1.1	1
4b(i)	3.1.2	4
4b(ii)	3.2.3	1
4b(iii)	3.2.3	3
4b(iv)	3.2.2	1
4b(v)	6.1.4	1
4c	6.1.2	4

Question	Specification	Marks
5a	3.5.1	2
5b(i)	4.1.3	2
5b(ii)	1.1.1	5
5c	2.1.4	4
5d(i)	2.1.6	5