Mark Scheme (Pre-Standardisation)

November 2020

Pearson Edexcel International GCSE
In Computer Science (4CP0/01)
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.

Question Number	Answer	Additional Guidance	Mark
1(a)	Any **two** from: • (Share) access to the Internet/WWW/broadband connection (1) • (Internal) communication (using email/instant messaging/calendars) (1) • Share files/data (1) • Share peripherals/printers / hardware (1) • Increases the amount of storage (since network storage devices can be attached) (1) • Saves money on licences (since network site licences for software are usually cheaper than buying a stand-alone licence for every machine) (1) • Centralised backup (1) • Centralised security (1)	• Award examples if mapped to a bullet point • Do not award the same bullet more than once • Do not award for install updates (in the stem)	2

Question Number	Answer	Additional Guidance	Mark
1(b) (i)	Any **two** from: • ~~Faster (data transfer) (1)~~ Not really true, its Greater bandwidth / more bits per second (1) • The connection does not get worse the further you are from the router / more reliable (1) • Connection does not get obstructed by walls, ceilings, and furniture (1) • More secure (1)	Accept reverse arguments for disadvantages of wireless.	2

Question Number	Answer	Additional Guidance	Mark
1(b) (ii)	Any **two** from: • Installation/maintenance is more complex (1) • Devices need to be physically connected (1) • Less portable / limited by length of cable (1) • Limited number of devices can be connected (1) • Some digital devices cannot use a wired connection (1) • Trip hazard (1)	Accept reverse arguments for advantages of wireless.	2

Question Number	Answer	Additional Guidance	Mark
1(c)	Award **two** marks for a linked description that addresses the individual mark points: The internet is a (global) network of networks/ connected devices (1) whereas the www is the collection of web pages/service accessed using the internet (1) / the www is resources located via URLs/domain names (1) The internet is the infrastructure (1) and the www is a service that runs on that infrastructure (1)		2

Question Number	Answer	Additional Guidance	Mark

1(d)	Award **two** marks for a linked explanation such as: Running out of IPv4 addresses/the number of (internet) connected devices has grown (1) IPv6 addresses are long/longer than IPv4 / the number of possible addresses is large/will last much longer (1)		2

Question Number	Answer	Additional Guidance	Mark
1(e)(i)	Star		1

Question Number	Answer	Additional Guidance	Mark
1(e) (ii)	Any **one** from: • easy to connect/remove new nodes (1) • failure of one node/link does not affect the rest of the network (1) • easy to detect the failure of one node/link (1)		1

Question Number	Answer	Additional Guidance	Mark
1(e) (iii)	Any **one** from: • if central switch/hub fails then the whole network fails (1) • performance and number of nodes that can be added depends on capacity of central switch/hub (1) • can require more cable than some of the other topologies (1)		1

Question Number	Answer	Additional Guidance	Mark

1(f)(i)	Any **two** from: • SMTP (1) • IMAP (1) • POP/POP3 (1)		2

Question Number	Answer	Additional Guidance	Mark
1(f)(ii)	Any **two** from: • passes the (reassembled) packets to the application layer (1) • check if all packets have arrived (1) • determine whether the contents are correct (1) • requests resending of lost or damaged packets (1) • reassembles packets in correct order/ into an email (1)	Do not accept receives from network layer (stem)	2

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	1101 1110 Award one mark for: • MSB = 1 (1) • Rest of pattern correct (1)		2

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	- (1) 119 (1)		2

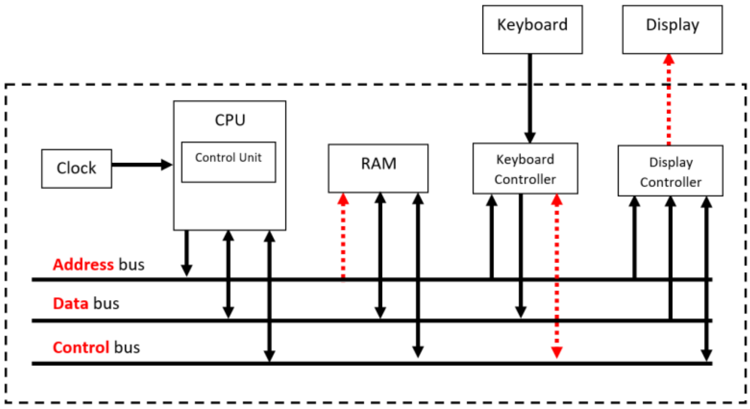
Question Number	Answer	Additional Guidance	Mark
2(b)	B 16		1

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	128	Allow the range 0-127	1

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	C		1

Question Number	Answer	Additional Guidance	Mark

2(c)(iii)	Award **two** marks for a linked explanation such as: (Before Unicode existed) there are hundreds of different encoding systems (1) and no single encoding system could contain enough characters to represent all major languages (1) Standard ASCII only provides 128 different patterns (1) can't represent all major languages/symbols/characters (1) Unicode uses a minimum of 16 bits (1) so can represent at least 2^{16} characters (1) Unicode has very large number of characters (1) can represent all languages/ASCII was developed (just) for English (1)		2

Question Number	Answer	Additional Guidance	Mark
3(a)	 Keyboard Display CPU Control Unit Clock RAM Keyboard Controller Display Controller Address bus Data bus Control bus - **Address bus** labelled correctly (1) - **Data bus** labelled correctly (1) - **Control bus** labelled correctly (1) - Arrow from address bus to RAM (1) - Bi-Directional arrows from control bus to keyboard controller (1) - Arrow points from display controller to display (1)		6

Question Number	Answer	Additional Guidance	Mark
3(b)	Award **two** marks for a linked explanation such as: The cache stores frequently used data/instructions (1) so the processor does not have to wait because cache is checked before main memory / because RAM is further away from the processor (1). It speeds up processing (1) because cache is a faster type of memory (1).		2

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(c)</td><td><table>
<tr><th>CPU1</th><th>CPU2</th></tr>
<tr><td>5 * 2 = 10</td><td>4 * 3 = 12 (1)</td></tr>
<tr><td>10 + 12 = 22 (1)</td><td>24 / 4 = 6 (1)</td></tr>
<tr><td>22 - 6 = 16 (1)</td><td></td></tr>
</table></td><td>The second row expressions can be in either column

22 – 6 = 16 May appear in either CPU in the final row</td><td>4</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3(d)	Any four from: • The OS checks whether sufficient space is available on the storage (media) for the file (1). • The file is broken into blocks (1) • The blocks are stored in spaces that are large enough (1) • OS looks for (fat/ntfs)/ reserves (linux) (groups of) contiguous blocks (1) • Blocks can reside anywhere on the storage (1). • The OS updates the file allocation table (with the start location and sequence number of each block) (1) • OS sets hard links to files (1) ntfs • OS updates journal/MFT (1) ntfs/linux • Metadata about the file such as read/write permissions, date created and last accessed is separately stored (1)		4

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	Digital (signal) / converted analogue (signal) (1)		1

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	Analogue (signal) / analogue (sound wave) (1)		1

Question Number	Answer	Additional Guidance	Mark
4(a)(iii)	2 Hertz / hertz /Hz (1)	• Do not penalise spelling • Accept 2 samples/cycles per second	1

Question Number	Answer	Additional Guidance	Mark
4(a)(iv)	Any **one** mark for: • The (analogue sound) wave will be represented more accurately / the fidelity/quality of the recording is improved (1) • The file size will increase / more data stored (as each sample takes up disk space) (1)		1

Question Number	Answer	Additional Guidance	Mark
4(a)(v)	• 3 (1) • The range of sampled sound is from 0-6. To store 7 distinct values, you need 3 bits (111 binary = 7 denary) (1) OR graph shows 8 possible values, 3 bits can store 0 - 7 / 8 values (1)		2

Question Number	Answer	Additional Guidance	Mark

4(a)(vi)	Correct binary value 101 (1)	Ignore leading zeros	1

Question Number	Answer	Additional Guidance	Mark
4(b)	819 seconds * 8 bytes * 47,000 hertz 819 x 8 x 47000 819 seconds * 64÷8 bytes * 47,000 hertz $\frac{818 \times 64 \times 47000}{8}$ 819 (1) 8 or 64÷8 (1) 47,000 (1) Fully correct expression (1)	Award equivalent expressions	4

Question Number	Answer	Additional Guidance	Mark
4(c)	Any **one** from: • The sound quality may be poorer/lower (for some people) (1) • Cannot get the original back after compression (1)		1

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(a)</td><td>
<table>
<tr><th>P</th><th>Q</th><th>R</th><th>Q OR R</th><th>P AND (Q OR R)</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
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<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>
Award <b>one</b> mark for each of:
• All possible combinations in columns P, Q and R (1)
• Correct values in Q or R (1)
• Correct values in final column (1)</td><td>Allow follow through for incorrect mark point 2.</td><td>3</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(b)	B AND S AND NOT L Award **one** mark for each of: NOT L or B AND S (1) Fully correct (1)	• Any order and ignore brackets	2

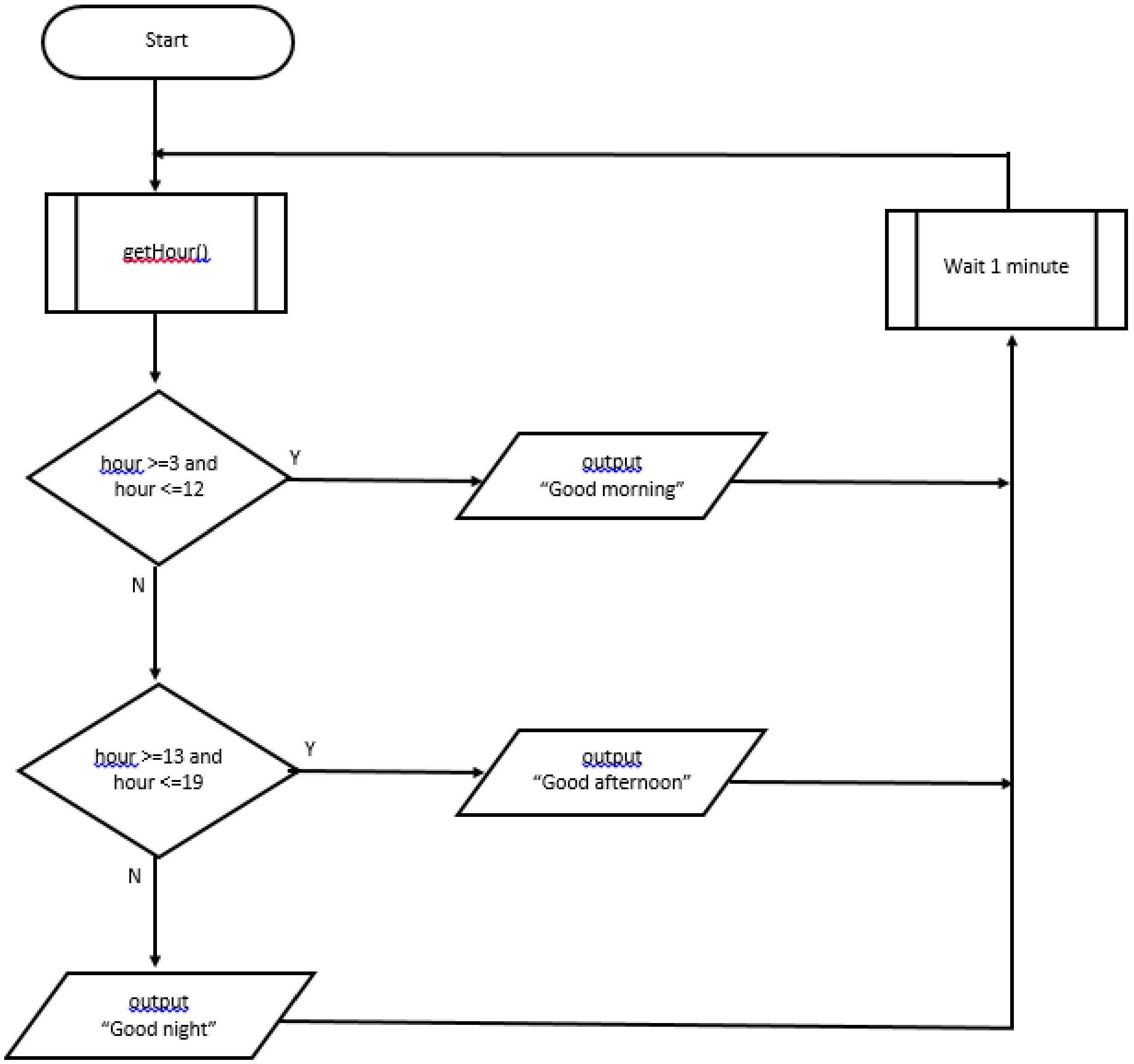
Question Number	Answer	Additional Guidance	Mark
5(c)	Any **two** of: • Remove code vulnerabilities in programming languages (1). • Eliminate bad programming practices (1).		2

Question Number	Answer	Additional Guidance	Mark
5(d)	Award **one** mark each for any of: • Copyright (1) • Patent (1) • Licensing (1) • Trademark (1)		3

Question Number	Answer	Additional Guidance	Mark
6(a)	Indicative content provided Other solutions do exist and should be awarded		6

Aspect of Solution	**Marks**			
	0	**1**	**2**	**3**
Functionality	No awardable content	There are significant errors in logic, leading to an overall solution that is non-functional	There are minor errors in logic, leading to an overall solution that is not completely functional	There are no errors in logic, leading to an overall solution that is fully functional
Accuracy of Notation	No awardable content	Notation follows a broadly unrecognisable convention that is applied inconsistently, although aspects of it are discernible	Notation follows a recognisable convention which is broadly discernible but is applied inconsistently	Notation follows a recognisable convention and is applied consistently throughout

There are a maximum of 3 marks for functionality.
There are a maximum of 3 marks for accuracy of notation.
The marks for functionality and accuracy are awarded independently.


Start
getHour()
Wait 1 minute
hour >=3 and
hour <=12
Y
output
"Good morning"
N
hour >=13 and
hour <=19
Y
output
"Good afternoon"
N
output
"Good night"

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	• papaya needs changing (1) • lychee needs ordering (1)		2

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	7 (1)		1

Question Number	Answer	Additional Guidance	Mark
6(b)(iii)	Replace 8 with LENGTH(flavours)/LENGTH(volume) (1) or A new line 7: WHILE i < LENGTH(flavours) DO (1) or WHILE i < LENGTH(volume) DO (1)	Ignore case If new line is given award mark if logic is clear	1

Question Number	Answer	Mark

6(c)	Indicative content: **Compiler** • One line of a compiled language maps to multiple executable instructions • Reads in a whole file and translates it at once • Produces an executable file • Executable file is portable between machines with the same architecture and operating systems • End-user cannot see the programming source code • Does not need an additional environment/software to run the code **Interpreter** • One line of a compiled language maps to multiple executable instructions • Reads, translates, and executes one line at a time • A special environment is needed to be installed on the user's machine to run the code; this is machine specific • Source code is portable to any machine with an interpreter which can run on it • End-user can see the programming source code **Similarities** • One line of a compiled language maps to multiple executable instructions/one to many relationship to machine code • Both are used to interpret high level programming languages • Both produce machine code from human-readable programming code **Differences** • Compiler reads in a whole file and translates it at once. Interpreter reads, translates and executes one line at a time • Compiler produces an executable file, interpreter does not • Executable files produced by a compiler will only execute on machines with the same architecture and operating systems. Source code produced by an interpreter is portable to any machine with an interpreter which can run on it • Compiled code does not require any additional software	6

	to execute the code. An interpreter needs a special environment to be installed on the user’s machine to run the code; this is machine specific	

Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made showing elements of knowledge and understanding of key concepts/principles of computer science. The discussion will contain basic information with little linkage between points made.
Level 2	3-4	Demonstrates adequate knowledge and understanding of key concepts/principles of computer science. The discussion shows some linkages and lines of reasoning with some structure.
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting relevant knowledge and understanding of key concepts/principles of computer science to support the discussion being presented. The discussion shows a well-developed, sustained line of reasoning which is clear, coherent, and logically structured.