Mark Scheme (Results)

June 2022

Pearson Edexcel GCSE In
Computer Science (1CP2/01)
Paper 1: Principles of Computer Science

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June 2022
Publications Code 1CP2_01_rms_20220825

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)	Any **two** from: • Can share files/data • Can share applications/software • Can collaborate • Can share peripherals (printers, speakers) • Can share connectivity (Internet connection, hotspot) • Can access files **from any computer** / **hot desk** • Central control/management (security, software updates, backup, remote support, users, remote monitoring) • Allows communication (email, social media, video conferencing, online meeting, collaborative games)		**2**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	A description such as: • A LAN covers a small (geographic) area / a WAN covers a large (geographic) area (2) • A LAN uses infrastructure owned by one company / a WAN uses third-party infrastructure (2) • A LAN connects individual devices / uses switches (1), whereas a WAN connects LANs / uses gateways (1)	Do not accept 'smaller/larger' in reference to the physical size of the network.	**2**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	B 17 080 000 *A 17 080 is not correct because it is 17.08 multiplied by 1000* *C 17 080 000 000 is not correct because it is 17.08 multiplied by 1000^3* *D 17 080 000 000 000 is not correct because it is 17.08 multiplied by 1000^4*	17 080 000 is 17.08 multiplied by 1000^2	**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(iv)	The delay/amount of time between data/signal being sent and it being received	Do not accept reference to delay/lag on its own.	**1**

Question Number	Answer	Additional Guidance	Mark
1(b)i **Clerical**	Any **one** from: • IP (address) • MAC (address)		**1**

Question Number	Answer	Additional Guidance	Mark
1(b)ii	A Data being sent *B is not correct because it is located in the header* *C is not correct because it is located in the header* *D is not correct because it is not located in a packet*		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)	A description to include two from: • Monitors/checks traffic (1) using a set of rules / list of authorised/unauthorised computers/addresses/protocols (1) to decide if data is allowed into or out of the network (1)		**2**

Question Number	Answer	Additional Guidance	Mark
1(d) **Clerical**	Any **one** from: • POP3 • IMAP • SMTP	Accept POP	**1**

Question Number	Answer	Additional Guidance	Mark
1(e)	A linked explanation such as: • All communication could fail (1) because/if the central device fails (1) • It can be difficult/expensive to set up (1) because each device needs a cable to connect to the central device (1) • The number of devices that can be connected is limited (1) because the central device supports a fixed number of connections (1)	For 'central device': • Accept 'router' or 'hub' (as a term to refer to a device that contains a switch). • Accept 'switch' (as this is the correct term to refer to the central device) • Do not accept 'server'	**2**

Question Number	Answer	Additional Guidance	Mark
2(a)i	Any **one** from: • To represent an instruction/command • To make an instruction/command easy to read/write/learn/remember/understand • An instruction in a set of instructions	Accept generic definitions of mnemonic such as: 'To shorten a piece of information so it is easy to remember.'	**1**

Question Number	Answer	Additional Guidance	Mark
2(a)ii **Clerical**	Assembly language		**1**

Question Number	Answer	Additional Guidance	Mark
2(a)iii	A linked description such as: • They are microprocessor/CPU/machine specific (1) so they can manipulate the hardware directly (1) • They can be highly optimised (1) to make efficient use of the hardware/execute more quickly/use minimal memory (1) • Each line of code (1) is one instruction only (1) Award responses that refer to machine code as a low level language, such as: • **Machine code** is written in binary (1) so instructions can be processed **directly** by the CPU / do not need to be translated (1) Award **one** mark for: • Machine code does not need to be translated (1)	Accept: (Assembly language) instructions are assembled (1) to machine code (1)	**2**

Question Number	Answer	Additional Guidance	Mark
2(a)iv **Clerical**	Interpreter		**1**

Question Number	Answer	Additional Guidance	Mark
2(b)	• Data • Instructions		**2**

Question Number	Answer	Additional Guidance	Mark
2(c)i	A description to include **two** from: A laser heats/burns (areas of a disk) (1), which creates lands/pits (1) representing binary / 1s and 0s (1)		**2**

Question Number	Answer	Additional Guidance	Mark
2(c)ii **Clerical**	Solid state / flash *Accept 'SSD' for solid state*		**1**

Question Number	Answer	Additional Guidance	Mark
2(d)	Any **two** from: • Limited processing resources • Low power consumption • Simple/robust operating system • Low cost per unit • Smaller in size • Less storage • Limited user interface	Do not accept: 'Carries out a specific task': This is the opposite of 'general purpose', which is given in the question.	**2**

Question Number	Answer	Additional Guidance	Mark
2(e) **Clerical**	A Reduces data transfer times C Reduces required storage space *B is not correct because parts of a compressed file can still be written to several different places on a disk* *D is not correct as compression does not make data more secure like encryption does* *E is not correct because error detection/correction mechanism are still needed in network packets*		**2**

Question Number	Answer	Additional Guidance	Mark
2(f)	Any **two** from: • Programming language specific vulnerabilities (directly manipulating memory) • Security (vulnerability) • Weak design • Insufficient testing • Bad programming practices (not following standards, using unvalidated 3rd party libraries) • Inadequate validation (that fails to prevent incorrect/inappropriate data input) • Inadequate authentication (that enables hackers to gain unauthorised access) • Sensitive data not encrypted		**2**

Question Number	Answer	Additional Guidance	Mark
2(g)	A linked explanation such as: • Users can be added/deleted (1) so multiple people can use the same computer (1) • Edit user permissions (1) so only specific users can securely access their storage space (1) • Control the amount of resources/storage each user can access (1) so the limited storage on the machine can be shared (1) • Enforce user permissions (1) so only certain users are allowed to install programs / access certain files (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(i) **Clerical**	1 mark for each nibble: 0011(1) 1001(1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii) **Clerical**	1 mark for each digit in the correct location: 2D		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	A linked description such as: • Flip all the bits (1) and add one (1) • Copy/keep all the `0`s from the right/LSB, up to and including the first `1` (1), then flip the remaining bits (1) • Flip all the bits from the left/MSB (1) up to, but not including, the `1` nearest the right/LSB (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(iv)	A linked explanation such as: • There are not enough bits (1) to store the result (1) • An overflow occurs (1) because 1 + 1 = 0 with a 1 carry / because the result is more than 255 (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(b) **Clerical**	Lossy		**1**

Question Number	Answer	Additional Guidance	Mark
3(c)	A description to include **two** from: • A standard • For representing text/characters • Allows data to be interchangeable between computers (from different manufacturers) • Each character is mapped to a unique number/binary equivalent • ASCII (encoding) uses 7/8 bits • There are 128 unique characters (allow 256 for 128)	Award a mark for an example of an ASCII character equivalence e.g. A = 65 as this can be awarded from mark point 4. (A = 01000001 could similarly be awarded.)	**2**

Question Number	Answer	Additional Guidance	Mark
3(d)(i)	Any **one** from: • The number of pixels **per** (square) **inch** is higher • The density of pixels is higher		**1**

Question Number	Answer	Additional Guidance	Mark
3(d)(ii)	Award **one** mark for each number in the correct location for a maximum of 4: • 15 in numerator (1) • 1028 x 640 in numerator (1) • 1024×1024 in denominator (1) • 8 in denominator (1) Example of expression that gains full marks: $\frac{1028 \times 640 \times 15}{1024 \times 1024 \times 8}$	Award equivalent representations of 1024 (2^{10})	**4**

Question Number	Answer	Additional Guidance	Mark
4(a)	A linked explanation such as: • It helps prevent loss of data (1) because malware could deliberately delete data / because data can be deleted/corrupted accidentally (1) • It helps minimise disruption following a system failure (1) because data can be restored (1) • Data can be restored (1) because physical hazards (fire/flood) (can damage storage devices) (1)		**2**

Question Number	Answer	Additional Guidance	Mark
4(b)	Any **two** from: • That they are giving consent • That they can say no / refuse • That they are not denied service, if they say no • What the data is being collected for • What processing will be done on their data/purpose of the processing/how data will be processed • That they can withdraw consent at any time • That the data will be shared (with third parties) • How long it will be stored • That the data will be stored securely		**2**

Question Number	Indicative content	Additional Guidance	Mark
4(c)	Discuss how algorithmic bias can affect the decisions police forces make. **Causes of algorithmic bias** • Machine learning having been trained using insufficient/inappropriate data • Human bias leading to discrimination and a lack of fairness • Poor design of the algorithm **Impacts on individuals and communities of algorithmic bias** • Deploying officers to the wrong areas • Individuals may feel as though they are being monitored/targeted/subjected to unfair treatment as a result of the output of a biased algorithm deploying too many officers / too few officers • Discrimination/equality (e.g. resourcing police more heavily in particular communities) • Feedback loops (if a model predicting crime rates based on historical arrest data is used to prioritise police resources, then arrests in high risk areas could increase further, reinforcing the imbalance) source **Methods available to reduce the risk of algorithmic bias** • Human oversight and 'sense checking' and confidence/error ratings of predictions • Governance (anticipating and managing risks and make sure legal requirements are adhered to) • Auditing to enable identification and mitigation of systematic bias • Open to scrutiny / transparent • Involvement of communities during development • Improve the training data		**6**

Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made, showing elements of understanding of key concepts/principles of computer science. (AO1) The discussion will contain basic information with little linkage between points made or application to the context. (AO2)
Level 2	3–4	Demonstrates adequate understanding of key concepts/principles of computer science. (AO1) The discussion shows some linkages and lines of reasoning with some structure and application to the context. (AO2)
Level 3	5–6	Demonstrates comprehensive understanding of key concepts/principles of computer science to support the discussion being presented. (AO1) The discussion is well developed, with sustained lines of reasoning that are coherent and logically structured, and which clearly apply to the context. (AO2)

Question Number	Answer	Additional Guidance	Mark
5(a)(i) **Clerical**	Any **one** from: • Array • List		**1**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii) **Clerical**	Yellow		**1**

Question Number	Answer	Additional Guidance	Mark
5(a)(iii) **Clerical**	Abstraction		**1**

Question Number	Answer	Additional Guidance	Mark
5(a)(iv) **Clerical**	Decomposition		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)	A linked description such as: • If the value of the item at the current index position in the array is more than the value of the target (1), no more passes of the loop are required / the loop will exit (1) • If the pass through the loop goes past the expected location of the target value (1), the third condition for the loop to execute will not be met (1) • If the value (of 'theTarget') is exceeded without reaching the end of the array (1) the algorithm will end (1)	Do not accept 'index' in place of 'the value at the index'.	**2**

<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 correct row showing relationship of variable changes.

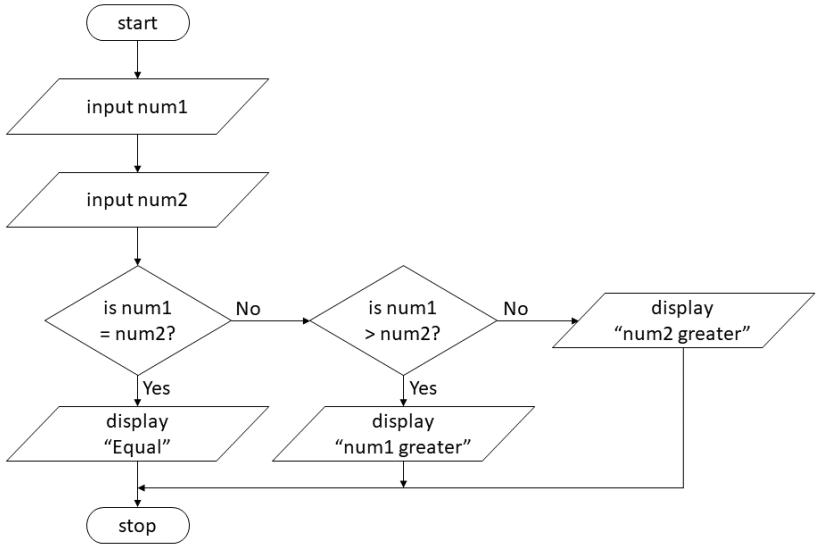
<table>
<tr><th>count</th><th>accept</th><th>reject</th><th>weight</th><th>Display</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td></td></tr>
<tr><td>1</td><td>1</td><td></td><td>404</td><td></td></tr>
<tr><td>2</td><td></td><td>1</td><td>393</td><td></td></tr>
<tr><td>3</td><td>2</td><td></td><td>395</td><td></td></tr>
<tr><td>4</td><td>3</td><td></td><td>405</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>3 1</td></tr>
</table></td><td>Different versions of trace tables are acceptable.

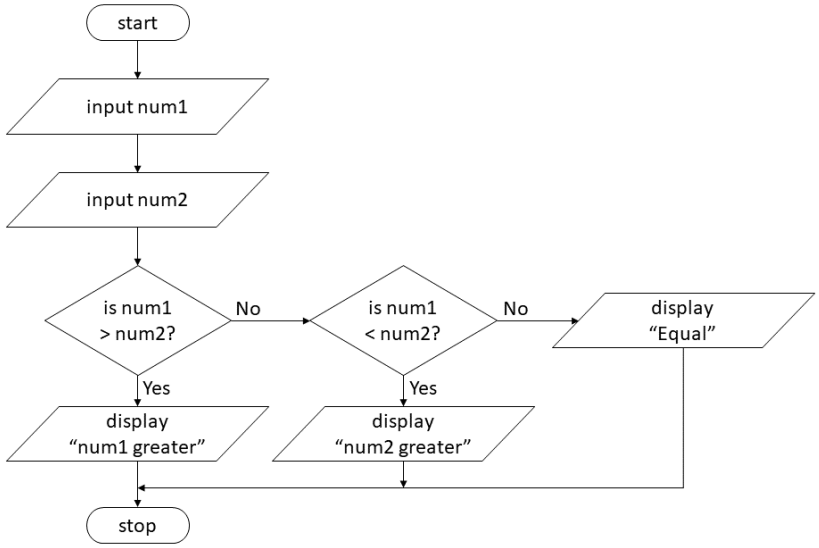
Blanks can be replaced with contents of previous row.

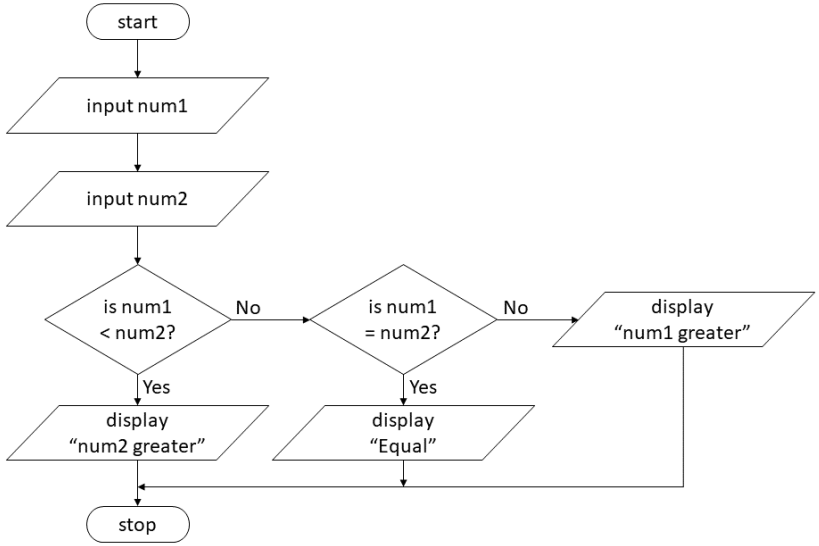
Final ‘3 1’ can be included on row above.

Ignore formatting of 3 1 in Display column (e.g. accept ‘3,1’)

Allow ‘Enter weight of box:’ in Display column until 3 1 should be displayed.</td><td>6</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(d)	• Both start and stop terminators present **and** algorithm terminates correctly at the stop terminator (1) • Two separate inputs for two integers (1) [can be in the same input symbol] • Test for equivalence, greater than or less than in one decision box (1) • Different test (for equivalence, greater than, or less than) in separate decision box (1) • Two outputs, labelled Yes and No, for each decision box (1) • Logic of flowchart links to **three** logically valid outputs (1) 	• Award 'End', 'Stop', 'Start' and 'Begin' as text for terminator symbols. • Award '==' and '=' used for equivalence inside decision symbol. • Accept 'Print' or 'Output' as an alternative to 'Display' in the output symbols. No quotes required around output string. • Accept True/False for Yes/No labels	**6**


start
input num1
input num2
is num1 > num2?
No
is num1 < num2?
No
display "Equal"
Yes
Yes
display "num1 greater"
display "num2 greater"
stop


start
input num1
input num2
is num1 < num2?
No
is num1 = num2?
No
display "num1 greater"
Yes
Yes
display "num2 greater"
display "Equal"
stop