Chhetri Academy

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GCSE COMPUTER SCIENCE

1.5

OCR J277 | Specification point 1.5.2

Utility software

Untiered

Answers and examiner comments

6	2014-2025	Untiered
question groups	available papers	tier

Using this booklet

1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

Name _____ **Date** _____

Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

8			System information : • displays important data about the current state of the computer • e.g. temperature, free memory, network speed, % processor used Diagnosis: • attempts to detect/resolve items that are not working correctly • e.g. missing drivers, network connection	4	1 mark each for explaining “system information” and “diagnosis” + 1 mark for each example – accept relevant examples, but not examples related to virus/malware for diagnosis. Examples should be specific examples of the use of these utilities rather than general descriptions.

4	a		• antivirus • firewall	2	

Question			Answer/Indicative content	Mark	Guidance
	b		e.g. • (User name and) password • Only allows you to use the system if you are authorised • Encryption • Prevents hackers from understanding any data if accessed (e.g. passwords) • Access rights • To prevent files from being modified/deleted • User access control • Prevents users from making changes to the system Marks in pairs	4	*Accept any security measure that is provided by the operating system itself but not by standard utility programs (even if the utility program is normally bundled with operating systems).* *The first bullet is for identifying or a brief description of a measure.* *The second bullet is for a further more detailed description or a description of how the measure ensures security.* Any reasonable biometrics is acceptable.

Original question 2

The full source mark scheme begins on page 24. Use the original paper code, tier and question number shown above.

2	a		1 mark for name, max 2 for description. e.g. • user interface • allows the user to communicate with the hardware • e.g. GUI/command prompt • allows the user to input data • outputs data to the user • memory management / multitasking • moves data between RAM and VM • gets data from RAM • stores data to RAM	6	Read whole answer for each. Max 2 for description, 1 mark for name.

			• switches between processes so fast it appears like it is multitasking • peripheral management / drivers • allows the installation of drivers to communicate with the peripherals • sends data to/from peripherals • sends data to/from buffers • user management • allows the setting up of accounts • security / setting of password • set different access rights • file management • creation/editing/renaming of files • creation/editing/renaming of folders • movement of files/folders		
2	b	i	Perform housekeeping/maintenance tasks	1	Not by example. Allow optimising system.
2	b	ii	1 mark per bullet to max 3 • full backup will copy every file and all data • incremental will only copy files/data that have changed • …incremental can only be done once a full backup has been completed • …reduces time taken to backup each time • …reduces storage/memory used to backup	3	
2	c		benefit e.g. other people can improve the program drawback e.g. cannot charge a fee // other people can use her code	2	Need to be benefit/drawback to developer
3	a		1 mark per bullet to max 2 e.g. • old devices may just be thrown • …increasing pollution / e-waste • …that will not degrade • new equipment uses up natural resources • new equipment increases distribution pollution • new devices may run more efficiently • other people can use the old ones second hand instead of more resources being used	2	

3	b		1 mark per bullet to max 2 e.g. • people may feel their devices are out-of-date • increased cost • social pressure to keep up-to-date • increase digital divide • more second hand become available • … for people who cannot afford new technology • Increase employment where the devices are being built	2	
4*			**Mark Band 3–High Level** **(6-8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* Covers ethical, legal and privacy. Must have positive and negative. **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* Covers at least 2 ethical, legal and privacy. May be only positive or negative.	8 AO2 1a (4) AO2 1b (4)	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: **Indicative Content:** Ethical • Pressure to have the best devices • Some students may not have devices • Liability for use • Students are not working on a level playing field Legal • responsibility for damage • may not have restrictions e.g. child safety Privacy • Students may have internet traffic monitored in school • School may wish to install software on students' devices • Students may use cameras on devices to record other students.

			Mark Band 1-Low Level **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* <u>Covers one from ethical, legal and privacy. May only be positive/negative.</u> **0 marks** No attempt to answer the question or response is not worthy of credit		

5			1 mark for each completed statement
			`function calculate(`**`measurement,`** `number)`
			
			`  if measurement = "gigabytes" then`
			
			`  value = number * 1024 * 1024 * 1024 * 8`
			
			`  elseif measurement =` **`"megabytes"`** `then`
			
			`  value = number * 1024 * 1024 * 8`
			
			`  elseif measurement =` **`"kilobytes"`** `then`
			
			`  value = number * 1024 * 8`
			
			`  elseif measure = "bytes" then`
			
			`  value = number *` **`8`**
			
			`  else`
			
			`  `**`return -1 // value = -1`**
			
			`  endif`
			
			`  return` **`value`**
			
			`endfunction`
				6	Allow singular/plural, ignore case/spelling

6	a		1 mark per bullet to max 2 • Software / applications / programs • …including OS • files	2	Allow each by example such as text files/images. Data is NE Instructions is NE

6	b	i	1 mark per bullet to max 3 • faster **access/read/write speed** • Smaller in physical size // more compact // weighs less • More durable/robust • Uses less power • Runs cooler • Quieter when running	3	Portable is NE no moving parts is NE on its own
6	b	ii	1 mark per bullet to max 2 • limited number of read/write times • more expensive (per byte) • (usually) smaller capacity	2	
7	a		1 mark per bullet either: • LAN is small geographical area • WAN is over a large geographical area or • LAN (usually) has own/dedicated infrastructure • WAN uses external/shared infrastructure // by example (e.g. internet)	2	LAN is one building is NE - this does not make it a LAN. WAN is multiple buildings - NE, a LAN can be multiple buildings.
7	b		1 mark per bullet • Central switch labelled… • …all devices connected to central switch only (BOD not labelled switch)	2	Ignore anything superfluous

7	c	i	1 mark per section Wi-fi frequency • 5GHz frequency can carry more data per second than a 2.4 GHz frequency // 5GHz frequency has can transfer data faster • 5GHz frequency has a shorter range so access may be limited Interference • Causes errors which means signals need retransmitting which makes more traffic • Objects may limit range // objects can block the signal Number of current users • more traffic means the same bandwidth is split // each user has less bandwidth // more collisions // more users = more traffic/data sent Type of network traffic • transmitting videos/large files will take up more bandwidth than text files	4	Answer must be more than repeating the question, question is **how**
7	c	ii	1 mark e.g. • If using wireless or wired • Error rate • Bandwidth	1	Accept others e.g. Topology Distance between nodes
7	c	iii	1 mark per bullet to max 4 • Data is split into packets (by originator) • Each packet has a fixed size • Each packet has a header • …that includes e.g. packet number/destination • Packets are sent individually • Packets can be sent in different routes • The receiving computer waits for all packets • … then puts them back in order (by packet number) • … sends requests for missing packets // missing packets are resent	4	

7	d	i	1 mark per bullet to max 2 description e.g. • can delete/corrupt files/data • can change files/data • can prevent the users accessing files • can replicate through (all connected) devices • record keypresses and transmit to third party • steal data • slow network speed // block access to network 1 mark for prevention e.g. • anti-spyware • anti-malware • anti-virus • firewall	3	
7	d	ii	1 mark per bullet to max 2 description e.g. • gains access to user's account//access your password • …can access (private/confidential) data • …can edit data • …can delete data • …can install malware • …use your gained password elsewhere • …block your access to your account 1 mark for prevention e.g. • firewall • strong password • two-step verification	3	

<table>
<tr>
<td>7</td>
<td>e</td>
<td></td>
<td>1 mark for each row

<table>
<tr><th>Protocol</th><th>Email</th><th>Transferring files</th><th>Accessing websites</th></tr>
<tr><td>POP</td><td>✓</td><td></td><td></td></tr>
<tr><td>FTP</td><td></td><td>✓</td><td></td></tr>
<tr><td>SMTP</td><td>✓</td><td></td><td></td></tr>
<tr><td>HTTPS</td><td></td><td></td><td>✓</td></tr>
</table>
</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>f</td>
<td></td>
<td>1 mark per bullet
e.g.
• Software governed network // non-physical network
• Multiple physical networks can appear as one virtual network
• One physical network can be split into multiple logical networks
• Computers in different locations connect to it through the Internet …
• …but get the functionality of a LAN</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>1 mark for each
• Copyright Designs and Patents Act
• Computer Misuse Act
• Freedom of Information Act
• Computer Misuse Act
• Data Protection Act // GDPR</td>
<td>5</td>
<td>Allow minor errors in names</td>
</tr>
</table>

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>3</td><td>a</td><td></td><td>1 mark for function and 1 name for task

<table>
<tr><th>Function</th><th>Task</th></tr>
<tr><td>Memory management // managing memory</td><td>Moves data from secondary storage to RAM</td></tr>
<tr><td>Peripheral management</td><td>• Receiving data from input devices
• Transmitting data to output devices
• Installing/downloading device drivers
• Allows communication from input device / to output device</td></tr>
<tr><td>File management // managing files</td><td>Allows the user to create, name and delete folders</td></tr>
<tr><td>User interface</td><td>• Outputting data to the user
• Receiving input from the user
• Allows user to communicate/interact with/control the computer
• Creating/displaying/allowing interaction with a GUI/command prompt interface</td></tr>
</table></td><td>4</td><td>BOD storage for memory in the first function.

Peripheral: allow input and output devices by example.

File management, do not award folder management.

The task for peripheral management needs to extend 'manage' i.e. 'manage output devices' is NE.</td></tr>
<tr><td>3</td><td>b</td><td></td><td>1 mark for each term

encryption software changes data using a key. If the changed data is intercepted it cannot be understood. This software does not stop the data from being intercepted.

defragmentation software analyses the data on a disk to find files that have been split and stored in separate locations. The split files are moved to be consecutive in storage and the free space is moved together. This does not provide more storage space on the disk, instead it makes the access of the data faster because the read head does not have to move as far to access the next part of the file.</td><td>6</td><td>Encryption
Key
Understood
Defragmentation
Consecutive
Access

Mark first answer in each space.</td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>1 mark for each row to max 5

<table>
<tr><th>Operating system function</th><th>Memory management</th><th>Peripheral management</th><th>User management</th><th>File management</th></tr>
<tr><td>Multitasking</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Renaming a folder</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>Creation of user accounts</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>Installation of a printer driver</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>Transfer of data to and from RAM</td><td>✓</td><td></td><td></td><td></td></tr>
</table></td><td>5</td><td></td></tr>
<tr><td>2</td><td>(b)</td><td>(i)</td><td>1 mark from
• Perform housekeeping tasks
• Perform maintenance // Keep the computer running smoothly // identify/fix errors // improve performance of computer
• To monitor / manage / configure a computer system</td><td>1</td><td>Do not accept a specific example of utility software.

Do not accept a task performed by one example of utility software.

Read whole answer and award a correct statement.</td></tr>
<tr><td>2</td><td>(b)</td><td>(ii)</td><td>1 mark each
• Jumble / mix-up / encode / scramble / cypher data
• Encrypt / decrypt using an algorithm / key
• Make it meaningless (if intercepted / unauthorised access) // it cannot be understood / used (if intercepted / unauthorised access)</td><td>3</td><td>MP3 do not accept it cannot be ‘read’ or ‘accessed’.</td></tr>
</table>

3			**Mark Band 3–High Level** **(6-8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* Includes benefits and drawbacks. At least one ethical and at least one environmental issue. References both customer and company clearly for top of band. Points are expanded. **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* Covers benefits or drawbacks to achieve band, top of band requires at least one of each. Covers ethical and/or environmental. Some points are expanded. May only reference customer or company. **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* Has a point for ethical/environmental/benefit/drawback, not all relevant. May not reference customer or company. **0 marks**	8	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: **Indicative Content:** Ethical issues: • Will cost remain the same? – unfair on customers • Will customers be told? Or are they being deceived? • Can improve profit for company – allow staff to be paid more • Ethical to the company but unethical to the customers • Reduced cost may mean reduced reputation- long term loss If people move to other companies • Customers want most up-to-date devices – prepared to spend regularly • Lower cost to purchase may allow more people to afford device Environmental issues • Increase in e-waste from products that are disposed

			• No attempt to answer the question or response is not worthy of credit		• Older devices could be distributed to people without devices to reduce waste • Products could be recycled for components Benefits and drawbacks: • Company Increase sales Increase profit Decrease popularity/reputation • Customer Increase in cost May be able to buy when couldn't before if initial cost is less Less reliable devices Effort/time to install new devices more regularly
4	**(a)**		1 mark each to max 2 • Small geographical location // single building • No use of external infrastructure // All hardware will be owned/managed by youth centre • Dedicated hardware // The hardware is not shared/used by anyone else/any other business • It is **not connecting networks** (like a WAN does)	2	Mark any two correct points as long as not contradicted.
4	**(b)**	**(i)**	1 mark each to max 2 • (Partial mesh) means all devices are connected to one or more devices // (Full mesh) means all devices are connected to every other device • No need for **central** management / switch / device / node // All devices are **equal** // **Decentralised** • Multiple routes/paths (between devices)	2	MP1 BOD each device is connected to other devices // all devices are connected MP2 do not accept no central **server**

4	**(b)**	**(ii)**	1 mark each to max 2 for drawback max 2 for benefit e.g. Benefits: • No **purchase/cost** of central switch / device • … lower cost to install/maintain network // no need to setup / connect to the central device • More connections/paths between devices // alternate routes • … no single point of failure // if a connection breaks can still connect • … more robust structure • More scalable // can have more devices/connections/nodes/computers • … easier to add devices • … can add / remove nodes without impacting other nodes/speed • Decrease in latency • … fewer collisions • Can be setup over a larger area // can provide a more stable connection • … each device acts as repeater Drawbacks: • Large number of / more **connections/wires** • … can involve redundant connections • … this is impractical • Reduced central management/control/oversight of the network/transmission • … less **control** over transfer/security of the network • Less secure BOD example less secure • … more routes/points/devices for data **interception/attack/unauthorised access** • Difficult to find an error • … because of the multiple routes where an error could occur • Mesh network uses more power • … more nodes are involved in each transmission	4	1 mark for a point 1 for expansion/reason/benefit. Any of the MPs can be the benefit/drawback and can be the expansion as long as they follow on. Do not accept faster/slower transmission speeds – dependent on media and many other factors. MP3 and MP4 can be in a single statement e.g. 'If one connection breaks the nodes can still connect through another route'

<table>
<tr>
<td>4</td><td>(c)</td><td>(i)</td>
<td>1 mark each to max 3 e.g.
• Easier to add more devices/users
• Can have more devices/connections/users // more scalable
• … without cost of purchase/install additional wired connections
• Devices are not fixed to one spot // devices can be moved // can connect from anywhere in (wireless) range
• …allowing people to use them where they are needed // can use where there is no physical connection
• Reduces risk of (additional) trailing wires
• Less potential damage to equipment/wires
• Connect wider range / more types of device // by example e.g. mobile phones/tablets
• … that don’t have ports / wired connections // that only have wireless connections
• It allows a backup network if the wired network fails
• (Due to each node acting as a repeater in the mesh) the network will have a greater range</td>
<td>3</td>
<td>MP1 is for easier to add more devices to the network.
MP2 is there can be more connections/nodes/devices than on a wired.
‘more devices can be added easily’ is MP1 on its own.</td>
</tr>
<tr>
<td>4</td><td>(c)</td><td>(ii)</td>
<td>1 mark per bullet to max 2 for each factor
<table>
<tr><th>Factor</th><th>How it affects the performance</th></tr>
<tr><td>Bandwidth</td><td>• More bandwidth = faster network/transmission BOD better performance
• …because more data is transferred simultaneously/per second</td></tr>
<tr><td>Number of users accessing the network at the same time</td><td>• More users = slower network/transmission BOD worse performance
• …because more data is transferred simultaneously // more traffic // the bandwidth is being shared/used // more bandwidth used // BOD more congestion / collisions</td></tr>
</table>
</td>
<td>4</td>
<td>Allow reverse of each.

Do not award references to Internet speed alone.

Points need to reference more/less data in correct context.</td>
</tr>
</table>

<table>
<tr><td>4</td><td>(d)</td><td></td><td>1 mark each to max 5 e.g.
Can be expensive for large amounts of data / long term / hosting // may be ongoing subscription // no control over changing costs
May be limited amount of storage
No control over security // Need to rely on provider for security
May be hacked/stolen/intercepted/affected by a virus
May lose (personal) data // May lose access to data
May go against DPA/legislation // Data may be misused (by provider)
May not be clear where in the world the data is stored
Limited/No control over access
Company/cloud could go down
No control over backup // May not have (automatic) backups …
… data is not retrievable
Need internet access // no internet access means no data
… access speed depends on network/connection speed
Concerns over ownership of the data
Need to remember login details // may forget/lose login details
Users may need training</td><td>5</td><td>MP1 needs more than high cost, it needs identification of ongoing, cost for hosting etc.

MP3 just poor/low security is NE

Accept data may be sold as example of misuse.</td></tr>
<tr><td>4</td><td>(e)</td><td>(i)</td><td>1 mark for router/modem</td><td>1</td><td></td></tr>
<tr><td>4</td><td>(e)</td><td>(ii)</td><td>1 mark for each row.

<table><tr><th>IP address</th><th>Valid (✓)</th><th>Invalid (✓)</th></tr><tr><td>192.154.21.2</td><td>✓</td><td></td></tr><tr><td>258.0.0.3</td><td></td><td>✓</td></tr><tr><td>56.1.2.66.1</td><td></td><td>✓</td></tr><tr><td>251.58.3.7</td><td>✓</td><td></td></tr></table></td><td>4</td><td>Do not award rows with 2 ticks.

Allow Xs in place of ticks in either/both columns.</td></tr>
</table>

4	**(e)**	**(iii)**	1 mark each to max 4 • Browser checks **cache** for matching IP address • URL/domain is sent to DNS • **DNS** looks for URL/domain to find matching IP • …in table/database/files/lists (of URL/domain and IPs) • If not found the request is transferred to higher-level DNS • DNS returns IP address to **computer/browser** • An error is **returned/sent** if the IP address cannot be found	4	MP3 – award for the use of the DNS converting URL to IP MP5 accept another/larger for higher-level MP6 needs to be computer/browser, do not award user on its own.
4	**(f)**		1 mark for legislation Data Protection Act (2018) // DPA // GDPR // Data protection 1 mark each for steps to max 3 e.g. • Identify data protection officer • Keep data secure/safe (from unauthorised access) • ... by example // installing firewall // usernames and passwords // access rights // physical security // encrypt • Do not share/sell (without consent) • Don't store without consent • Only keep relevant data • … do not collect data from users that is not required • Do not store the data for longer than needed • Make sure the data remains accurate / up-to-date • Only use for purpose collected // Data must not be misused • … state purpose for collection • Do not store/share with countries with lower levels of protection • Change/delete data when requested … • … permanently/securely • Provide data for users when they request to see it • Notify individuals of data breaches • Must use data lawfully/fairly • Staff need to be trained in principles	4	If no legislation, wrong legislation, unclear legislation still award up to max 3 marks for description of DPA. Accept answers listing what needs to be done e.g. data must be up-to-date (without the specific step that will be followed to do this)? MP2 is stopping unauthorised access. MP4 is the company actively giving the data willingly to someone else.

PMT

GCSE (9–1)

Computer Science

J276/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2019

PMT

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It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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PMT

J276/01 Mark Scheme June 2019

Annotations

Annotation	Meaning
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
^	Omission mark
BOD	Benefit of doubt
C	Subordinate clause/Consequential error
	Cross
E	Expansion of a point
FT	Follow through
NAQ	Not answered question
NBOD	Benefit of doubt not given
P	Point being made
REP	Repeat
	Slash
	Tick

PMT

J276/01 Mark Scheme June 2019

Subject Specific Marking Instructions

LEVELS OF RESPONSE QUESTIONS:
For answers marked by **levels of response**:
• to determine the level – start at the highest level and work down until you reach the level that matches the answer
• to determine the mark within the level, consider the following

The indicative content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.

Using 'best-fit', decide first which set of BAND DESCRIPTORS best describes the overall quality of the answer. Once the band is located, adjust the mark concentrating on features of the answer which make it stronger or weaker following the guidelines for refinement*.

Highest mark: If clear evidence of all the qualities in the band descriptors is shown, the HIGHEST Mark should be awarded.

Lowest mark: If the answer shows the candidate to be borderline (i.e. they have achieved all the qualities of the bands below and show limited evidence of meeting the criteria of the band in question) the LOWEST mark should be awarded.

Middle mark: This mark should be used for candidates who are secure in the band. They are not 'borderline' but they have only achieved some of the qualities in the band descriptors.
Be prepared to use the full range of marks. Do not reserve (e.g.) high Band 3 marks 'in case' something turns up of a quality you have not yet seen. If an answer gives clear evidence of the qualities described in the band descriptors, reward appropriately.
*When only two marks are available (low mark band) only use Highest and Lowest mark guidance for 'best-fit'.

J276/01 Mark Scheme June 2019

	AO2.1a	AO2.1b
High (thorough) (6 – 8 marks)	Precision in the use of terminology. Knowledge shown is consistent and well-developed. Clear appreciation of the question from a range of different perspectives making extensive use of acquired knowledge and principles of computer science.	Understanding of concepts is consistently applied to context enabling a logical and sustained argument to develop. Examples used enhance rather than detract from response.
Middle (reasonable) (3 – 5 marks)	Awareness of the meaning of the terms in the question. Knowledge is sound and effectively demonstrated. Demands of question understood although at times opportunities to make use of acquired knowledge and concepts are not always taken	Understanding of concepts is shown and is applied to context. There is clear evidence that an argument builds and develops through the response but there are times when opportunities are missed to use an example or relate an aspect of understanding to the context provided.
Low (basic) (1 – 2 marks)	Confusion and inability to deconstruct terminology as used in the question. Knowledge partial and superficial. Focus on question narrow and often one-dimensional.	Inability to apply understanding of key concepts in any sustained way to context resulting in tenuous and unsupported statements being made. Examples if used are for the most part irrelevant and unsubstantiated.
0 marks	No response or no response worthy of credit.	No response or no response worthy of credit.

PMT

J276/01 Mark Scheme June 2019

Question			Answer	Mark	Guidance
1	a	i	1 mark for each completed word CPU stands for **Central Processing Unit**. It is the part of the computer that fetches and executes the **instructions** that are stored in **(main) memory**. The CPU contains the Arithmetic **Logic** Unit (ALU) and the **Control** Unit (CU).	5 AO1 1a (5)	Accept: • RAM/registers in place of "memory" • bod cache/MDR/CIR in place of memory • 'and Logic' in place of Logic • ignore 'data' if they put 'data and instructions' but no mark for data on its own • Do not award command for instructions • Bod central processor unit • Bod logical
1	a	ii	1 mark per bullet to max 2 • Dual core is 2 processors/cores // double the number of processors/cores • Parallel processing can take place • … which means each processor can execute a separate instruction **at the same time** // each processor can run a different part of the program **at the same time** // each core can process instructions **independently** of each other • ...which enables multitasking • Some processes/software **cannot** be split between two processors so it does not increase the performance	2 AO1 1b (1) AO2 1b (1)	• Needs the notion of the processors acting at the same time i.e. not just 'it can run twice as many instructions' without 'at the same time'. • Do not award more instructions per second - this could be achieved by having a faster clock speed. • Allow FDE for 'executing instructions'. • Do not allow 'cores can split the tasks' – need to be how i.e. one task for each core to run at the same time. • BOD run more than one program at once

PMT

J276/01 Mark Scheme June 2019

1	a	iii	1 mark per bullet to max 2 • Cache stores frequently/recently/next to be used instructions/data • …that can be **accessed** faster than **accessing** them from RAM • …which means more cache improves the performance of the CPU // less cache decreases the performance of the CPU • Too much cache can be detrimental … • …as it will take longer to find the instructions in cache	2 AO1 1b (2)	• No mark for just defining cache as being fast memory or close to the CPU. • No mark for cache is faster than RAM - faster at what? • Bod - More cache makes the processing faster • Bod - More cache makes the computer run faster

J276/01 Mark Scheme June 2019

<table>
<tr>
<td>1</td><td>b</td><td>i</td>
<td>1 mark for each row
<table>
<tr><th></th><th>RAM</th><th>ROM</th></tr>
<tr><td>Stores data</td><td>✓</td><td>✓</td></tr>
<tr><td>The memory is volatile</td><td>✓</td><td></td></tr>
<tr><td>Data will not be lost when the computer is turned off</td><td></td><td>✓</td></tr>
<tr><td>Data is read-only, cannot be changed.</td><td></td><td>✓</td></tr>
<tr><td>Stores currently running data and instructions</td><td>✓</td><td></td></tr>
</table>
</td>
<td>5
AO1 1a (5)</td>
<td></td>
</tr>
<tr>
<td>1</td><td>b</td><td>ii</td>
<td>1 mark
• RAM is volatile // Flash memory is non-volatile
• RAM is faster to access/store data than Flash memory // Flash memory is slower to access/store data than RAM
• RAM stores currently running programs/instructions/data/OS // Flash memory stores files and software
• RAM can be directly accessed by CPU // Flash data has to go to RAM before CPU</td>
<td>1
AO2 1a (1)</td>
<td>• Accept description of volatile/non-volatile
• Bod - RAM is primary // Flash is secondary</td>
</tr>
<tr>
<td>1</td><td>c</td><td>i</td>
<td>1 mark for any suitable example
e.g.
Solid state drive // SSD // flash drive
USB memory stick // USB drive
Memory card // SD card</td>
<td>1
AO1 1b (1)</td>
<td>• USB on its own is incorrect.
• Accept USB stick // memory stick
• Do not accept Hard drive, bod solid state hard drive</td>
</tr>
</table>

J276/01 Mark Scheme June 2019

1	c	ii	Secondary	1 AO1 1b (1)	• FT from (i) e.g. if RAM is given for 1ci then this answer must be primary. • FT USB (NE 1ci) as secondary. • If 1ci is NR or not an example of primary or secondary storage, then 0 for whatever is here.
1	c	iii	**Mark Band 3–High Level** **(6-8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors.	8 AO2 1a (4) AO2 1b (4)	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: **Indicative Content:** <u>Portability</u> • Both are Small in size / portable and can easily be moved between Kerry's home and work • Solid state can be smaller • Solid state less likely to break <u>Robustness</u> • Optical are not robust i.e. easily scratched/damaged while being moved • Solid state has no moving parts so unlikely to break if dropped <u>Capacity</u> • CDs have small capacity • Depends on Kerry's files if they are small files e.g. text documents then a CD

			There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence. **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No attempt to answer the question or response is not worthy of credit		might be large enough bit if there are lots large files e.g. videos/software then solid state may be more appropriate <u>Cost</u> • Optical cost is small per GB • Solid state can be reused more times because it's more durable so may be cost effective in the long term
1	c	iv	1 mark for correct working e.g. 5*1024 // 5*1000 1 mark for 5120 MB // 5000 MB	2 AO2 1b (2)	

PMT

J276/01 Mark Scheme June 2019

2	a		1 mark per bullet to max 3 e.g. • He can place his files into folders/directories • He can (re)name files/folders • He can move his files/folders • He can copy/transfer/export files/folders • He can delete his files/folders • He can set permissions/access rights • He can search for files • He can view file details/extensions/file size/type • He can create files/folders • He can sort files/folders // he can put files into a specific order // by example • He can open files/folders	3 AO2 1a (3)	• Answers must be clear as to what the answer is applied to i.e. 'you can open it' - what is it? • Mark first answer on each section. • Do not award: o defragment o view files o download o compression o preview o edit/read/write files • 'Organise files' without what into - is not enough.

J276/01 Mark Scheme June 2019

2	b	i	1 mark per bullet to max 4 e.g. • Use an algorithm • …to remove **repeated/unnecessary** data • Could use lossy/lossless • **lossless** will not remove data permanently // **lossless** means original file will be restored • **lossy** is **permanent** deletion // **lossy** means original file will not be restored • Reduce number of pixels // reduce resolution • Record the changes in the colour for each pixel • … instead of the colour • Run length encoding • … record the colour and number of consecutive pixels of that colour • … instead of the colour of every pixel • Decrease colour depth//decrease number of colours	4 AO2 1a (2) AO2 1b (2)	• 'lossy removes unnecessary data permanently' gets 3 marks, 1 for lossy, 1 for 'removes unnecessary data' if not already awarded and 1 for lossy = permanent • Do not award 'not noticeable to the human eye', or 'keeps same/reduces quality' - this does not explain **how** the file is compressed. • Do not accept information for data.
2	b	ii	1 mark per bullet to max 2 E.g. • Defragmentation software • Encryption software • Backup software • Anti-virus • Firewall • Anti-spyware • Disk checker/cleaner • Auto-update • Disk formatting	2 AO1 1a (2)	• Do not accept compression • Accept anti-malware
2	c	i	Smart watch	1 AO2 1a (1)	CAO

PMT

J276/01 Mark Scheme June 2019

2	c	ii	1 mark per bullet for justification to max 2 • A smart watch is not a general-purpose computer • … which means the smart watch has one/limited/specific/dedicated function(s) • Smart watch has a microprocessor • … on a single circuit board • It is a computer system that is built within the watch • Runs firmware • Smart watch has built-in OS // difficult to change/manipulate the OS/function • Smart watch has few components all essential to its purpose • Smart watch has specific hardware required to function i.e. speaker/headphones	2 AO2 1b (2)	• Answers must be applied to scenario. Do not award generic definitions. • Allow opposite reasons for why a laptop is not an embedded system but do not allow repeated points.

J276/01			Mark Scheme		June 2019
3	a	i	1 mark per bullet to max 3 e.g. • Malware could be put on the computer • Data protection legislation states personal data must be protected / breaks Data protection legislation • … breach of privacy • …he could lose his job • Delete files // change data • … so the important work is lost/changed • Steal files/data/information // copy data/files/information // keylogger transmits data/files/information to third party • … use for illegal activities • … e.g. profit from the data // gain private information // leak information to the public • Data could be locked	3 AO2 1b (3)	
3	a	ii	1 mark for naming, 1 for description to max 2 per method e.g. • Password • No access without the password // **description** of strong password // limit attempts to guess // changing it regularly • Limited attempts to get into laptop • before laptop is locked • Firewall • Monitor incoming and outgoing transmissions // Stop unauthorised/unwanted incoming/outgoing transmissions/packets. • Biometrics • Need fingerprint/retina scan • Do not leave laptop logged on/unattended • So that other people cannot physical access it • Physical security // keep in locked room • So that people cannot physically access the laptop	4 AO1 1a (2) AO2 1a (2)	• Do not accept encryption/anti-malware, this will not prevent unauthorised access. • Do not accept penetration testing - it's a laptop, not a network. • Login is NE for password • Do not accept access rights - it's access to the laptop

J276/01 Mark Scheme June 2019

			• Do not connect laptop to network // standalone computer • So that there are no network threats • Two-step verification // two-factor authentication • For example sending code to mobile phone		
3	b	i	1 mark per bullet to max 2 • Uses an algorithm to • … jumble/scramble/mix up the data // turns it into cypher text // by example • If it is accessed it cannot be **understood** // it is **unintelligible** • Use of keys to encrypt/decrypt data	2 AO1 1a (1) AO2 1b (1)	• 'Need the key to understand the data' can get both MP2 and 3 • Cannot read the data // data is unreadable is NBOD

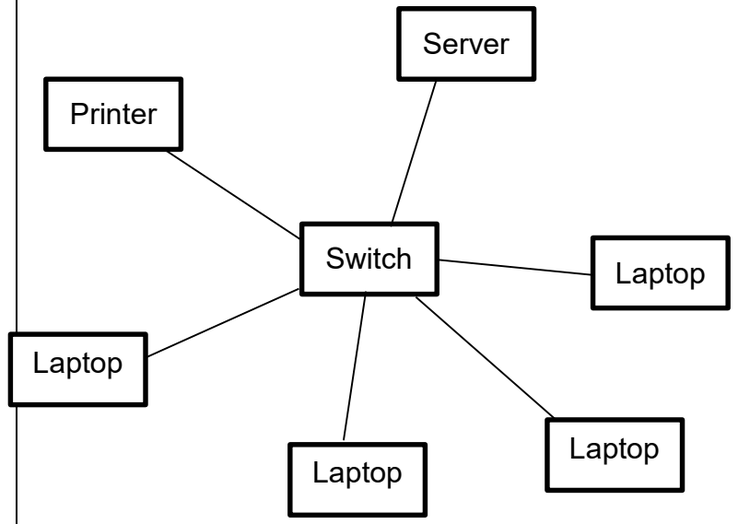
3	b	ii	1 mark for each completed piece of code
			
			`message = input("Please enter your string")`
			`newMessage = ""`
			`messageLength = message.length`
			`for count = 0 to` **`messageLength - 1//`**
			`message.length - 1`
			`  ASCIIValue = ASC(message.subString(`**`count`**`,1)`
			`  ASCIIValue = ASCIIValue +` **`1`**
			`  if ASCIIValue > 90 then`
			`  ASCIIValue =` **`ASCIIValue`** `- 26`
			`  endif`
			`  newMessage =` **`newMessage`** `& CHR(ASCIIValue)`
			`next count`
				5
				AO3 2b (5)
					• For `messageLength - 1` in loop accept `messageLength` or `message.length`
					
					• Spelling must be exact, do not penalise case.

PMT

J276/01 Mark Scheme June 2019

3	b	iii	1 mark for suitable output e.g. `output(newMessage) // print(newMessage)`	1 AO3 2b (1)	• Must logically work. Do not accept "" around `newMessage`. • Parentheses not required. • Do not accept: • `newMessage = output(newMessage)` or similar • Accept any output method • Bod - if the candidate outputs something extra it must be valid i.e. a variable from the program, or additional text in a string with suitable concatenation e.g. `print(newMessage + asciiValue)` is ok but `print(newMessage is the new message)` is not.

J276/01 Mark Scheme June 2019

4	a	i	1 mark per bullet • Four laptops/computers, a server and printer present and clearly identifiable (positions do not matter) • Switch as a device clearly identifiable… • …all devices directly connected to the switch and only the switch (FT from MP2) e.g.  	3 AO2 1a (3)	• Printer may be connected to the server or to the switch. • Accept PC for laptop • If the candidates has given server/switch or switch/server in the centre, mark the first one in their list. If they give server/switch, they do not get MP2, but allow access to MP3.
4	a	ii	1 mark per bullet to max • To connect the devices together • Receives data/packets/traffic • Direct/send data/packets/traffic **only** to its **destination** • Creates/generates a list of devices connected to it as it receives signals • Uses MAC addresses of devices connected to it	2 AO1 1a (1) AO2 1a (1)	• Do not award information, penalise once. • Do not award packet switching out of context. • Accept MP3 by example

PMT

J276/01 Mark Scheme June 2019

4	b	i	1 mark per bullet to max 2 • Wireless transmission is slower **than cabled** • More devices/users could be connected e.g. mobile phones // increase in traffic • …reducing bandwidth available for each user // insufficient bandwidth for users/demand • Wireless can be limited by interference • …such as walls that disrupt the signal // from other wireless networks/users	2 AO1 1b (1) AO2 1b (1)	• Bod - wireless has less bandwidth
4	b	ii	1 mark per factor e.g. • Bandwidth available • Number of users (using the network at the same time) • (Number of) data collisions • Interference // by example e.g. walls • Distance data has to travel // signal strength • Amount of data being transferred • Applications being used • Server/CPU performance • Using a hub instead of a switch	2 AO1 1a (2)	• Do not accept wireless/wired connections • Bod answers such as cable length

J276/01 Mark Scheme June 2019

4	c		1 mark per bullet to max 2 • Non-physical network • A **private** network that runs on a **public**/**existing** network • Combining 1+ physical networks into 1 logical network // 1+ logical networks on 1 physical network // partitioning part of physical network • It uses software to separate the Virtual Network from the wider network • Users in the Virtual Network can only access data in the Virtual Network • Employees can log in / join the private network from any location • Employees can access the server/documents from any location // only gives users of the Virtual Network access to the data • The connection is secured	2 AO2 1a (1) AO2 1b (1)	
5	a		1 mark per bullet to max 5 • The website is hosted on a webserver • The website/webserver has an IP address • (Browser) sends URL to DNS • URL has a linked IP • DNS finds IP • If DNS cannot find the IP it passes request to higher DNS • …if not found return error • IP address sent back to the browser/computer • (Browser) sends request to IP/webserver • Webserver processes request for the website/webpage • …webserver sends the webpage/file/data to the user	5 AO1 1b (3) AO2 1b (2)	• Do not award 'the IP goes to the webserver' • Allow domain name in place of URL • 'DNS finds the IP of the URL it is given' gets 2 marks, 1 for URL has linked IP and 1 for DNS finds the IP • MP 11 do not accept webserver *loads* the webpage on the user's computer
5	b	i	1 mark per bullet to max 2 • A layer can be removed/changed etc. • …without affecting any other layers • Each layer has its own purpose // separates the purposes // self-contained • ...so it does not need to consider what the other layers do • …so it can be programming individually • Individual protocols are each smaller/simpler to manage • Different layers can interface with different hardware	2 AO1 1a (1) AO1 1b (1)	• Do not award descriptions of what the layers do - the question asks why layers are used. • Do not award vague answers e.g. layers make it easier to work with

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<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>b</td><td>ii</td><td>1 mark for each protocol.

<table><tr><th>Task</th><th>Protocol</th></tr><tr><td>Sending an email from one mail server to another</td><td>SMTP // Simple Mail Transfer Protocol</td></tr><tr><td>Transmitting a file from a client to a server</td><td>FTP // File Transfer Protocol</td></tr><tr><td>Viewing a website using a web browser</td><td>HTTP // Hypertext Transfer Protocol
HTTPS // Hypertext Transfer Protocol Secure</td></tr><tr><td>Downloading an email to your computer</td><td>IMAP // Internet Message Access Protocol
POP(3) // Post Office Protocol</td></tr></table></td><td>4
AO2 1a (4)</td><td>• Mark first answer in each box</td></tr>
<tr><td>6</td><td>a</td><td></td><td>1 mark per bullet
Benefits of not providing physical copies e.g.
• Less/no plastic/paper/raw materials used in manufacture // no need for packaging // less waste
• Less electrical power needed to manufacture
• No petrol used to distribute/collect
• …smaller carbon footprint
• Fewer disks need to be manufactured
• Fewer factory emissions // less pollution
• Old versions will be thrown away

Drawbacks of still creating a physical copy (sold online) e.g.
• Plastic/paper are used in manufacture
• Increase in waste
• Old versions will be thrown away
• Uses petrol / creates emissions to distribute</td><td>2
AO2 1b (2)</td><td>• Could be read as still physically creating but not putting in shops.

• Do not accept more use of computers/electricity to download.</td></tr>
</table>

PMT

J276/01 Mark Scheme June 2019

6	b		1 mark per bullet to max 2 for justification • She can sell it for a fee • Protects/copyrights her **source code** • …so it can't be copied/modified/redistributed	2 AO2 1b(2)	• Accept in reverse for why open source is not appropriate, but do not award same MP twice

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Question 3 (a)

3 A computer has an operating system and utility software.

(a) The table contains operating system functions and a task that each function performs.

Complete the table by writing the two missing function names and a task performed by the two given functions.

Function	Task
	Moves data from secondary storage to RAM
Peripheral management	
	Allows the user to create, name and delete folders
User interface	

[4]

Candidates were often able to identify the function of memory management and file management for the given tasks.

Few candidates were able to identify a task performed by peripheral management. Candidates often rephrased 'peripheral management' for example stating that it managed the peripherals or managed the hardware without identifying what this involved. The stronger responses identified the role of device drivers to allow for communication between the computer and the peripherals.

Candidates often gave a suitable task for the user interface, most commonly that it allowed the user to communicate with the computer or hardware.

Question 3 (b)

(b) Complete the description of utility system software using the words provided in the box. Not all words are used.

access	amount	apart	compression	consecutive
defragmentation	deleted	encryption	key	lock
quantity	separate	speed	understood	

..... software changes data using a ..... . If the changed data is intercepted, it cannot be ..... . This software does not stop the data from being intercepted.

..... software analyses the data on a disk to find files that have been split and stored in separate locations. The split files are moved to be ..... in storage and the free space is moved together. This does not provide more storage space on the disk, instead it makes the ..... of the data faster because the read head does not have to move as far to access the next part of the file.

[6]

Candidates were often able to accurately identify some of the missing words. The spaces for encryption were more often accurate, with a common error being the use of a lock to change the data instead of a key.

Candidates often identified defragmentation accurately but the remaining spaces were more often inaccurate with access or separate often given in the next space.

Question 4*

4* A computer programmer has developed a computer game that they want to release for users to download over the internet. The programmer needs to decide whether to release the game as open source or proprietary software.

Discuss the features, benefits and drawbacks of each type of licence for this program and make a recommendation to the programmer.

You should include the following in your answer:
- features of each licence
- legal and ethical issues of each licence
- benefits and drawbacks of each licence. **[8]**

This question required candidates to provide an extended response. An extended response can be given in the form or paragraphs, key points as well as a table of points. Candidates need to make sure they are covering the three bullet points in the question for both the open source licence and proprietary. The question also asked for a recommendation to the programmer.

Candidates were often able to identify the features of each licence, for example if the source code was provided. Candidates often included benefits and drawbacks, for example being able to edit the program to tailor it to their needs, the potential of misuse of the program code. Candidates often covered legal and ethical issues within their benefits and drawbacks without explicitly identifying them.

Fewer candidates included a recommendation for the programmer. Candidates described each in turn without identifying which one should be used. Some candidates suggested that both were suitable and it was the programmer's decision, but the question asked for a recommendation.

The stronger responses discussed each licence in turn and then in the final paragraph started with a clear recommendation and justified the reasons for this by providing a summary of the points they had discussed in detail previously.

Exemplar 1

bringing safety to the program. Moreover, the programmer can earn money from people using the programs, as they can charge a fee. Furthermore, a license is required to use or share the program, ensuring that it's under the Copyright Law. However, due to the fee, it may not be accessible to all, and since no one can access the source code, feedback may not be as good disabling it from improving. Overall, the programmer should release it as proprietary software, seeing as though they can earn money, and the program cannot be altered. Furthermore, a license is required to use and share it, something open source software don't need, ensuring the originality of the Programs remains.

This response has a clear recommendation at the end of the response. They have stated that the programmer should use proprietary and provided a summary of the reasons (discussed previously) as to why they think this is the most appropriate recommendation.

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Examiners' report

GCSE

COMPUTER SCIENCE

OCR Level 1/Level 2 GCSE (9-1) in Computer Science

J277

For first teaching in 2020

J277/01 Summer 2025 series

Version 1

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Contents

Introduction 3
Paper 1 series overview 4
Question 1 (a) 5
Question 1 (b) (i) 6
Question 1 (b) (ii) 6
Question 1 (b) (iii) 7
Question 1 (c) 7
Question 2 (a) 8
Question 2 (b) (i) 8
Question 2 (b) (ii) 9
Question 3* 10
Question 4 (a) 12
Question 4 (b) (i) 13
Question 4 (b) (ii) 14
Question 4 (c) (i) 15
Question 4 (c) (ii) 16
Question 4 (d) 18
Question 4 (e) (i) 18
Question 4 (e) (ii) 19
Question 4 (e) (iii) 20
Question 4 (f) 21
Question 5 (a) 22
Question 5 (b) 23
Question 5 (c) 24
Question 5 (d) 24
Question 5 (e) 25
Question 6 (a) 25
Question 6 (b) 26
Question 6 (c) 26

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Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate responses is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from Teach Cambridge.

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Did you know that you can save this PDF as a Word file using Acrobat Professional?

Simply click on **File > Export to** and select **Microsoft Word**

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Paper 1 series overview

Component 1 focuses on theoretical concepts of Computer Systems including:

- systems architecture
- memory and storage
- computer networks, connections and protocol
- network security
- systems software
- ethical, legal, cultural and environmental concerns.

Candidates were often able to express their understanding of a range of topics and gave clear responses that made correct use of technical terminology. Some candidates made attempts at applying their understanding to the scenario and used expansions to link their points to the scenario.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• expanded each point made in Question 3 to explain how it applied to the given scenario • planned their response to Question 3 to make sure they covered all the requirements in the bullet points • demonstrated an understanding of network hardware and how a mesh topology is the physical connections between devices as opposed to the software and management of devices on the network.	• focused entirely on the negative points for Question 3, or only considered a potential increase in profit as a benefit • gave points related to the topic without answering the specific questions, for example defining the term bandwidth and not how it affects the performance of a network.

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Question 1 (a)

1 A student is creating a presentation containing images and sound.

(a) One of the files is an audio recording.

Complete the description of how a computer stores sound. Fill in the gaps using the given list of terms. Not all terms will be used.

analogue	colour depth	higher	repeated	smaller
binary	digital	lower	sample rate	unique
bit depth	height	measuring	sampling	
byte	hertz	recording	seconds	

An ..... sound wave needs to be converted into a digital sound wave.

Sound ..... is when the amplitude of the sound wave is measured at set intervals.

The ..... is the number of times a second the sound wave is measured. This is given in Hertz.

Each amplitude is given a ..... binary number. The number of bits allocated to each sample is the ..... .

The ..... the number of bits, the wider the number of amplitudes can be measured.

[6]

Candidates were often able to demonstrate a good understanding of sound representation, identifying the appropriate missing terms. Candidates most commonly correctly identified that an analogue wave is converted into digital.

The final space was often inaccurately completed with smaller, when instead it is the higher the number of bits the wider the number of amplitudes.

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Question 1 (b) (i)

(b) The student creates 10 bitmap images using a computer.

Each image has a colour depth of 8-bits and a resolution of 800 × 500 pixels.

(i) Define the term pixel.

.....

..... **[1]**

Some candidates found it challenging to define the term pixel. The most common accurate responses identified it as the smallest part of an image, or a single square of one colour.

Some responses described it as a square that contains many colours; while one pixel can have a different colour stored in it at different times, it can only ever have one colour at a time. Other inaccurate responses included describing it as a bit of data or just a square on a screen; when a square on a screen can be made up of many pixels.

Question 1 (b) (ii)

(ii) Calculate the total file size of the 10 images in kilobytes.

Show your working out.

.....

.....

.....

File size: ..... kilobytes

[2]

Candidates were often able to accurately show part of the working, most commonly for multiplying 800 and 500. Fewer candidates were able to complete the calculation to gain the correct response. A common missed element was giving the file size of one image instead of multiplying it by 10 to give the file size of the ten images.

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Question 1 (b) (iii)

(iii) State the minimum number of bits that will be needed to represent 240 different colours.

..... **[1]**

There were a mix of responses to this question, with some candidates giving 2^240, 256, etc. Some candidates identified the need for 8 bits but gave the response to the question as 2^8, meaning that there would be 256 bits.

Question 1 (c)

(c) The student wants to use a secondary storage device to move their files to their home computer.

Identify whether the student should use an optical or solid-state type of secondary storage device. Justify your choice.

Optical or solid-state .....

Justification .....

.....

.....

.....

.....

..... **[4]**

Candidates were often able to justify the type of storage that they selected.

Solid-state was most commonly selected, with responses identifying the small size, durability, portability and large capacity. Some candidates stated that it was faster than optical, without referencing what it is faster at, i.e. reading/writing data.

Some candidates accurately justified solid-state, by identifying that it had sufficient capacity for the files and that it was portable.

The stronger responses justified the choices for the given scenario, identifying that images could have large file sizes so the solid-state would be more likely to hold all of the required files, or that the need to transport that device might damage an optical disk by scratching it.

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Question 2 (a)

2 A computer has an operating system.

(a) Tick (✓) **one** box on each row to identify the operating system function that will manage each task.

Operating system function	Memory management	Peripheral management	User management	File management
Multitasking				
Renaming a folder				
Creation of user accounts				
Installation of a printer driver				
Transfer of data to and from RAM				

[5]

Candidates were often able to identify renaming a folder as file management.

Multitasking was most commonly incorrect, with a range of responses commonly including peripheral or user management.

Printer driver was occasionally inaccurately given as file or memory management instead of peripheral management.

Question 2 (b) (i)

(b) A computer also has utility software.

(i) State the purpose of utility software in a computer.

.....

..... **[1]**

The most common responses related to utility software being used to maintain the computer, or to perform housekeeping tasks. Some responses identified it as managing utilities or providing utilities which was insufficient to explain what a utility was and its purpose.

Some candidates gave specific examples of utility software and what this software did, for example defragmentation of encryption. These did not answer the question of the purpose of utility software in general, instead just the purpose of that one example of utility software.

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Question 2 (b) (ii)

(ii) Explain the purpose **and** function of encryption software.

.....

.....

.....

.....

.....

..... **[3]**

Common responses included the use of a key to encrypt or decrypt the data. Some candidates identified that this key scrambled the data or turned it into cypher text.

Misconception

Encryption does not stop data from being intercepted and does not stop the data being read. The transmission of encrypted data can be intercepted and the datafile can be opened. However, the datafile will be meaningless and not make any sense. The data is still there, but mixed up by the key and the encryption algorithm.

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Question 3*

3* A company designs and builds tablet computers. The company wants to reduce the cost of manufacturing their tablet computers. The company also decides to stop releasing software updates for their older tablet computers. This means customers will need to change their devices more often.

Discuss the impact of these decisions on the company and the customers.

Include in your answer:
- ethical issues
- environmental issues
- benefits and drawbacks. **[8]**

Many responses were suitably structured, with the stronger responses taking each of the bullet points in the question in turn. Some responses made appropriate use of bullet points and tabular structures, especially for the benefits and drawbacks which presented their arguments appropriately. When using bullets and tables candidates need to make sure they include their expansions alongside.

Candidates often focused on the drawbacks of the decision, most commonly the environmental impact of the waste generated from replacing devices. Similarly, many responses identified a potential increase in the digital divide. The most common argument was that people could not always afford to purchase new devices, and so would not have access to the most up-to-date technology..

Fewer responses considered a range of potential benefits beyond the increased profit for the company. Some stronger responses identified recycling the old devices to avoid waste, and providing these older devices at a lower cost to people who could not afford the newest devices.

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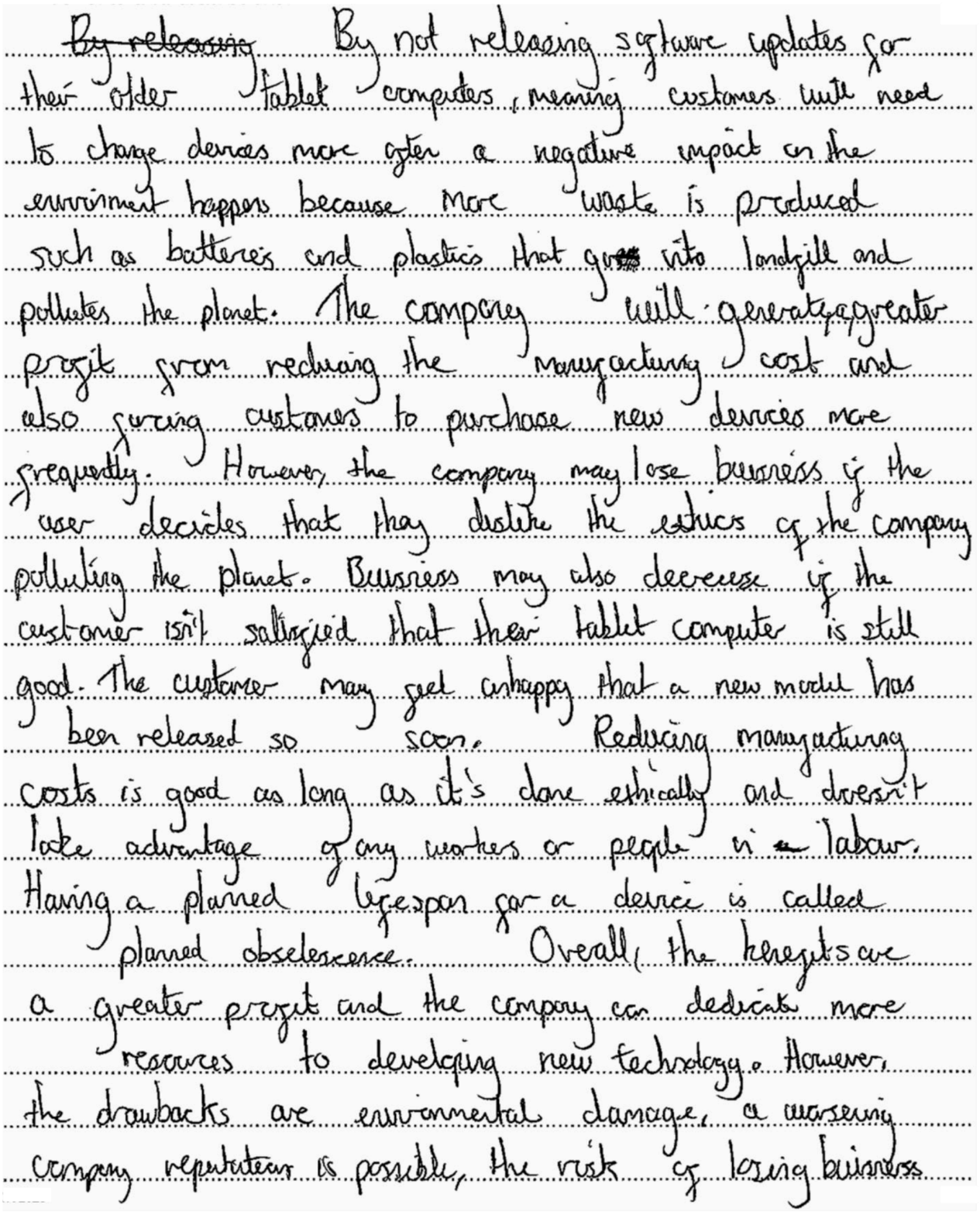
Exemplar 1



~~By releasing~~ By not releasing software updates for their older tablet computers, meaning customers will need to change devices more often a negative impact on the environment happens because more waste is produced such as batteries and plastics that goes into landfill and pollutes the planet. The company will generate a greater profit from reducing the manufacturing cost and also forcing customers to purchase new devices more frequently. However the company may lose business if the user decides that they dislike the ethics of the company polluting the planet. Business may also decrease if the customer isn't satisfied that their tablet computer is still good. The customer may get unhappy that a new model has been released so soon. Reducing manufacturing costs is good as long as it's done ethically and doesn't take advantage of any workers or people in labour. Having a planned lifespan for a device is called planned obsolescence. Overall, the benefits are a greater profit and the company can dedicate more resources to developing new technology. However, the drawbacks are environmental damage, a worsening company reputation is possible, the risk of losing business

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and the ethical implications of ensuring that manufacturing is carried out ethically and not taking advantage of less fortunate people.

In my opinion, I would advise against this change as the risks are very large and outweigh the potential positives for the company.

This candidate considers both the benefits and drawbacks. They identify the environmental drawbacks of extra pollution and that customers may not be happy at having to replace devices so often.

The response also considers the benefits of the company increasing their profits. This is expanded to explain how the profit can lead to more benefits, that they could put more resources into developing new technology.

This response gained the top band mark because they included ethical and environmental impacts. They gave benefits and drawbacks. The response had expansions; the candidate did more than stating a point, they explained why it was relevant, or how this was a drawback. They also considered both the customer and the company and how the decision would affect both.

Question 4 (a)

4 A youth centre is creating a network with 20 computers in a single building that will be connected in a Local Area Network (LAN).

(a) Identify **two** reasons why this network will be a LAN and not a Wide Area Network (WAN).

1 .....

.....

2 .....

.....

[2]

The most common response related to the distance of the network, identifying it as a small geographical area. Some candidates identified that the youth centre would own the hardware, or that external hardware would not be used. Some responses identified that a WAN is (usually) connections between networks, while a LAN is connections between nodes.

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Misconception

A LAN and WAN are not defined by the number of computers that are connected. A WAN can have a smaller number of devices than a LAN. The differences are the distance between these devices and the hardware that is used to connect them.

Question 4 (b) (i)

(b) The network design connects the computers in a mesh topology.

(i) Describe what is meant by a mesh topology.

.....

.....

.....

..... **[2]**

Candidates often identified that devices are all connected to each other. Some candidates then confused a mesh topology with a client-server network and explained the use of a central device.

Misconception

A mesh network is the connections between devices in a network, it is not how the software for the network operates for example as a client-server network.

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Question 4 (b) (ii)

(ii) Describe **one** benefit **and one** drawback of the network using a mesh topology instead of a star topology.

Benefit .....

.....

.....

.....

Drawback .....

.....

.....

.....

[4]

The most common benefit was that there is no single point of failure, or by description that if one connection failed there is another connection.

Few candidates identified a drawback. Candidates commonly referred to a star being able to install software on each device and that a mesh would not, but the star would need to include software to manage the network such as in a client-server model. The most common drawback identified was the increased number of connections between devices, which if cabled would be inconvenient to physically try and connect all devices to every other device.

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Question 4 (c) (i)

(c) The network design originally only had wired connections. The design is updated to include wireless connections via Wi-Fi.

(i) Explain the benefits to the youth centre of also providing Wi-Fi connections.

.....

.....

.....

.....

.....

..... **[3]**

This question was often answered well with candidates identifying benefits of wireless connections, most commonly that devices could be moved around the youth centre and that some devices did not allow for wired connections as they do not have the required ports.

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Question 4 (c) (ii)

(ii) The decision to use wired and/or wireless connections can affect the performance of the network.

Complete the table by explaining how each factor can affect the performance of a network.

Factor	How it affects performance
Bandwidth	....
Number of users accessing the network at the same time	....

[4]

The stronger responses clearly identified how the factor changed and the effect this had. Some responses did not identify the change, for example for bandwidth stating that there is a better performance of the network without identifying whether the bandwidth was higher or lower for this to happen.

Responses for bandwidth were often insufficient to explain how the performance was affected, for example that more data could be transmitted – but not at the same time. Some candidates gave a definition of bandwidth without identifying how it affects the performance.

Responses for the number of users commonly identified that more users would equate to more data, or that more users would slow the network.

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Exemplar 2

Factor	How it affects performance
Bandwidth	a higher bandwith means that more data packets can be sent across the network simultaneously
Number of users accessing the network at the same time	The more number of users, the more ~~the~~ slow it will be as they are all using the network.

This response for bandwidth has identified that more bandwidth means more data is transmitted simultaneously but has not given the effect of the performance. They have not identified that this in turn means that the performance will improve.

The response for the number of users has been given a benefit of doubt mark for 'the more number of users, the more slow it will be'; 'the more slow' is given for the performance. Stronger terminology would have been slower transmission, slower performance, but this was considered as sufficient to demonstrate the understanding of the effect on the performance. The candidate has not explained this change on the performance, for example how it is not slower.

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Question 4 (d)

(d) The youth centre is going to store data about users and events using cloud storage.

Describe the drawbacks to the youth centre of storing the data on the cloud.

.....

.....

.....

.....

.....

..... **[5]**

Candidates were often able to demonstrate a good understanding of the drawbacks of using the cloud. The most common responses included the need for a connection to the Internet to access the data. Stronger responses also identified that the youth centre would not have control of where or how the data was stored, for example that they would not have control over the security measures. Some candidates inaccurately stated that the cloud was less secure. This may be the case in some scenarios, but the cloud is not always less secure than other methods. The drawback of security is that the user does not have control over it.

Misconception

A Wi-Fi connection does not equate to an internet connection. Candidates often put that without access to Wi-Fi data the cloud could not be accessed. Data could still be accessed through any other connection to the internet.

Question 4 (e) (i)

(e) Users will have access to the internet.

(i) Identify **one** device that will be required to allow the LAN to connect to the internet.

..... **[1]**

Many candidates were able to identify the use of a router or modem. Common incorrect responses included a network interface card, wires or a computer.

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Question 4 (e) (ii)

(ii) The computers will be allocated an IPv4 address.

Tick (✓) **one** box on each row to identify if the IPv4 address is valid **or** invalid.

IPv4 address	Valid (✓)	Invalid (✓)
192.154.21.2		
258.0.0.3		
56.1.2.66.1		
251.58.3.7		

[4]

Candidates were often able to correctly identify whether several of the addresses were valid or invalid, most commonly that the last one was valid.

Candidates often incorrectly stated that 192.154.21.2 was invalid and that 56.1.2.66.1 was valid.

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Question 4 (e) (iii)

(iii) When a user wants to access a website they enter the URL into the address bar of a web browser.

Describe the steps that take place to convert the URL into the website's IP address.

.....

.....

.....

.....

.....

..... **[4]**

Some candidates were able to give a detailed description of each step in the process of converting a URL to an IP. These responses were often logical and described the URL being transmitted to the DNS, that then looked for the corresponding IP in its database and returned this to the computer.

Some candidates inaccurately identified that the URL was transmitted to a web server instead of a DNS.

Some responses lacked the detail to meet the mark points, for example identifying that data was transmitted to the DNS without what the data contained. Some responses identified the IP being transmitted back to the user, instead of to the user's computer or web browser; the user does not receive the IP.

Exemplar 3

the client would enter the URL / web address into the browser. If the URL is then looked up on a domain name table. If the URL / web address is not found, it is looked up on the domain name table again until it is found. If the URL / web address is found, it is converned into the IP address using DNS.

This candidate identifies that the URL is looked up on a domain name table, which gains MP4 but does not identify how the URL arrives with the DNS. The candidate also describes it being looked up again if it is not found. This does not identify that it goes to another, or higher level, DNS – looking up the URL in the same table will give the same result. The final statement identifies that the URL is converted into IP using the DNS which is awarded for MP3, that the DNS has looked for the URL to find that IP address.

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Question 4 (f)

(f) Identify **one** piece of legislation that the youth centre will need to follow when storing users' data **and** describe the steps they need to take to meet the requirements of this legislation.

Legislation .....

Steps the youth centre needs to follow .....

.....

.....

.....

.....

.....

.....

[4]

Responses often correctly identified the data protection act or GDPR as being the legislation. Some identifications were descriptions of legislation, for example to keep data secure, instead of the actual name of the legislation.

Candidates commonly identified the need to keep the data secure and often gave a suitable method for this such as encrypting the data. Some responses also gave detailed steps that the youth centre would need to follow, such as allowing access when requested, deleting data when no longer needed, making sure that the data is kept up to date and not sharing the data without consent.

Some candidates inaccurately identified the Computer Misuse Act or Copyright Designs and Patents Act, which are not followed when storing user's data.

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Question 5 (a)

5

(a) Tick (✓) **one** box to identify the quantity of megabytes that is the same as 2 terabytes.

- ☐ 2000 MB
- ☐ 20 000 MB
- ☐ 200 000 MB
- ☐ 2 000 000 MB

[1]

Candidates were often able to correctly identify 2 000 000 as the correct response.

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Question 5 (b)

(b) Each row in the table contains a number that is written as a denary value, 8-bit binary value and a 2-digit hexadecimal value. Some values are missing.

Complete the table by writing in the missing value for each number.

Denary	8-bit binary	2-digit hexadecimal
38		26
	01001110	4E
156	10011100	
215		D7

[4]

Candidates were often able to correctly convert the numbers between the different bases.

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Question 5 (c)

(c) Complete the binary addition of these two 8-bit binary numbers.

Show your working out.

```
  0 1 1 1 0 0 1 1
+ 0 0 1 1 0 1 0 0
-----------------
```

[2]

Candidates often gained the correct final answer. Some candidates did this by converting the binary numbers into denary and then converting the result back, which did not gain the working mark for binary addition. Some candidates did not include the final carry in their working, only showing two carries and writing the final carry direct into the position of the most significant bit.

Question 5 (d)

(d) Tick (✓) **one** box to identify the result of a 2-place right binary shift on the binary number 01110111.

- ☐ 00011101
- ☐ 11101110
- ☐ 00111011
- ☐ 11011100

[1]

Candidates were often able to correctly identify the result of the shift.

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Question 5 (e)

(e) Describe the binary shift that can be used to multiply any number by 8.

.....

..... **[2]**

Candidates commonly identified that a left shift was required. Fewer candidates identified the correct number of positions with common errors including four or eight positions.

Question 6 (a)

6 A computer uses the ASCII character set.

Part of the ASCII character set is shown here:

Character	Binary code
K	01001011
L	01001100
M	01001101
N	01001110

(a) Write the binary code to represent the word POP using ASCII.

.....

.....

.....

..... **[2]**

Candidates were often able to correctly convert one of the characters into ASCII. Some candidates attempted to add together the binary values for the three characters to give one 8-bit value.

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Question 6 (b)

(b) A new computer is being built.

Identify **one** benefit and **one** drawback of the computer using Unicode instead of ASCII.

Benefit .....

.....

Drawback .....

.....

[2]

Candidates were often able to identify that there were more characters in Unicode than ASCII. This was conveyed in a variety of ways, for example that more languages could be used, or by example such as Unicode allows for emojis.

Some candidates were also able to identify a drawback as it requires more memory or storage for the final file.

Some candidates inaccurately gave the reverse, thinking that Unicode had fewer bits and therefore less characters than ASCII.

Question 6 (c)

(c) The computer's CPU contains registers.

Complete the table by identifying **two** registers **and** state the purpose of each register.

Register	Purpose
.....	....
.....	....

[2]

Many candidates were able to identify registers that are in the CPU, most commonly the MAR and MDR. Some candidates inaccurately identified other components of the CPU such as the ALU and CU.

Candidates were often able to gain the mark for a description of the MDR. Some candidates inaccurately identified the MAR or the PC as storing data instead of the address of the data. Candidates who gave the accumulator sometimes gave a response that it stored the calculations instead of the result of the calculations.

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