Chhetri Academy

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GCSE COMPUTER SCIENCE

1.6

OCR J277 | Specification point 1.6.1

Ethical, legal, cultural and environmental impact

Untiered

Answers and examiner comments

6	2014-2024	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.

5	a		Input device: • e.g. (touch screen, menu/next/prev page) buttons / keypad / touchpad / microphone Output device: • e.g. screen, speaker	2	Accept any devices relevant to an e-book reader. For input device accept a clear description of an inbuilt scrolling device such as a trackball, but do not accept "mouse". Also do not accept a clear indication of a software keyboard as this is a piece of software rather than a device. For output device, accept "monitor"
	b	i	• Solid state	1	

Question			Answer	Mark	Guidance
		ii	• Fast access... • ... less delays when turning the device on/ turning pages etc... • No moveable parts/robust • ... can be handled/manipulated/moved without damaging it • Small/light enough… • … to fit within a hand held device • low power • …to extend battery life of reader	2	No follow through from (i). Candidates need to identify a relevant characteristic of solid state storage for the first mark, and expand by explaining why this is an advantage in an e-book reader for the second mark. Note that portable/capacity are not acceptable answers here (as solid state storage is not particularly more portable/larger than other forms of storage for this application)
	c	i	eg • Cheap to produce • Easily portable / Fits in a magazine • Enough capacity for e-books • Can be read by other devices e.g. computers • Read only / can't write over	2	Note that portable/capacity are acceptable answers here (as they are relevant characteristics of a CD ROM) Do not accept "compact" (unless portability is clearly implied)
		ii	• optical	1	
	d	i	• Source code not made available/ Only compiled code is published • Licence restricts the copying/modifying/distribution of the software	2	The mention of a licence is not sufficient. Candidate should state that the licence restricts copying/modifying/distributing. "closed source" is not enough because it just gives an alternative term for "proprietary" without a description of what we mean by "closed"

A451 **Mark Scheme** **June 2014**

Question			Answer	Mark	Guidance
		ii	eg • Stops competing companies copying their software (or hardware/ebooks) • ... and producing similar/better products. • Ensures compatibility (with the e-book reader)... • ... as they can ensure that no modifications have been made (mark points in pairs).	2	The first mark is for identifying a relevant advantage *to the manufacturer*, and the second for details expanding this point. Accept answers about preventing reverse engineering the company's product or piracy of the company's software or e-books (e.g. DRM) as referring to the first set of answers.

Original question 3

The full source mark scheme begins on page 21. Use the original paper code, tier and question number shown above.

Original question 8

The full source mark scheme begins on page 41. Use the original paper code, tier and question number shown above.

Question			Answer	Mark	Guidance
5	(a)		1 mark each to max 2 e.g. • Locks • Keycard entry • Biometric **entry to room** • Passcode **entry to room** • Alarms • Security guards/team • CCTV	2	Secure room/device is TV Mark first in each answer space Do not award password, but do award passcodes/word on doors.
5	(b)		1 mark for each name, 1 per bullet for matching to description to max 2 each. e.g. • Anti-malware o Scans for / identifies virus/spyware/malware o Compares data to a database of malware o Alerts user and requests action such as .. o Quarantines/deletes virus/spyware/malware o Stops the download of virus/spyware/malware • Firewall o Scans incoming and outgoing traffic o Compares traffic to a criteria o Blocks traffic that is unauthorised o Blocks incoming/outgoing traffic • Encryption o Scrambles data o …using an algorithm o So if intercepted it cannot be **understood** o Key needed to decrypt • User access levels o Data can be read/write/ read-write // by example o Prevents accidental changes o Limits data users can access • Anti-virus	6	Mark method first. If method is wrong, do not read on. If method is unclear, or part of a description of a method, read full answer. If second method is a repeat of the first (for example password and then locking out) mark whole answer for max 3.

			o Scans for / identifies virus/malware o Compares data to a database of viruses/malware o Alerts user and requests action such as .. o **Quarantines/deletes** virus/spyware o Stops the **download** of virus/malware • Anti-spyware o Scans for / identifies spyware / keylogger o Compares data to a database of spyware o Alerts user and requests action such as .. o Quarantines/deletes spyware o Stops the download of spyware/malware • Passwords/biometrics/authentication o code/fingerprint etc. has to be **correctly** entered to gain access o strong password // letters, numbers, symbols // fingerprint is unique to individual … o harder/impossible for a brute-force attack to succeed o lock after set number of failed attempts • Two-step authentication o a code is sent to user's separate device o unauthorised person will need access to this device as well		

<table>
<tr>
<td>5</td>
<td>(c)</td>
<td></td>
<td>1 mark for each row
<table>
<tr><th>Event</th><th>The Data Protection Act (2018)</th><th>Computer Misuse Act (1990)</th><th>Copyright Designs and Patents Act (1988)</th></tr>
<tr><td>A company transmits personal data to another company without the individual's permission</td><td>✓</td><td></td><td></td></tr>
<tr><td>A school publishes their student's addresses on the school website.</td><td>✓</td><td></td><td></td></tr>
<tr><td>The interface for a piece of software is replicated by a rival company</td><td></td><td></td><td>✓</td></tr>
<tr><td>A user leaves a computer logged on and another person leaves them a message on their desktop</td><td></td><td>✓</td><td></td></tr>
<tr><td>A student guesses their teacher's password and accessing computer account</td><td></td><td>✓</td><td></td></tr>
</table></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(a)</td>
<td>(i)</td>
<td>1 mark per bullet to max 3
• (analogue) sound wave is sampled
• … amplitude/height (of wave) is measured
• … at set/regular time intervals // by example
• Each sample/measurement is stored as a binary number
• The binary number for each sample is stored sequentially</td>
<td>3</td>
<td>MP2 do not award frequency of the wave is measured</td>
</tr>
</table>

<table>
<tr><td>6</td><td>(a)</td><td>(ii)</td><td>1 mark for each row

<table><tr><th>Change</th><th>File size increases</th><th>File size decreases</th><th>Accuracy increases</th><th>Accuracy decreases</th></tr><tr><td>Duration changes from 10 minutes to 20 minutes</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>Sample rate changes from 44 kilohertz to 8 kilohertz</td><td></td><td>✓</td><td></td><td>✓</td></tr><tr><td>Bit depth changes from 8 bits to 16 bits</td><td>✓</td><td></td><td>✓</td><td></td></tr></table></td><td>3</td><td></td></tr>
<tr><td>6</td><td>(b)</td><td>(i)</td><td>T</td><td>1</td><td>Case sensitive

Mark first letter</td></tr>
<tr><td>6</td><td>(b)</td><td>(ii)</td><td>Unicode</td><td>1</td><td>Accept any other valid</td></tr>
<tr><td>6</td><td>(c)</td><td></td><td>1 mark each to max 3
e.g.
• Height
• Width
• Colour/bit depth
• Date
• Geolocation
• File size
• File type
• Compression type
• Author</td><td>3</td><td>Accept anything reasonable but not features of image e.g. names of people

Award resolution for height or width, but max 2 for resolution/dimensions/image size, height, width.

'Colour' on its own is NE.
'Size' on its own is NE.

Needs to be what is stored, e.g. date is stored, age of image is not stored.</td></tr>
</table>

6	**(d)**	**(i)**	1 mark each to max 2 • Reduces file **size** • Takes less time to transmit // faster to upload // faster to download • Requires less **storage** space (on the server/device) • May otherwise exceed **email** storage • Uses less bandwidth to transmit • Uses less data to send (e.g. mobile data)	2	Mark first answer in each section
6	**(d)**	**(ii)**	1 mark each to max 2 • Data will be **permanently** lost // not all data is recoverable • **Text files** cannot be compressed with lossy • Teacher requires the original/high quality **image/video/sound** files	2	MP2 is for identifying that the files contain text and they cannot be compressed with lossy

Original question 5

The full source mark scheme begins on page 56. Use the original paper code, tier and question number shown above.

Question			Answer	Mark	Guidance
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.* The answer covers all required elements (legal/ethical, benefits, drawbacks) given in the question about open source **and** proprietary and includes a recommendation with justification. The top of the band makes a clear and structured recommendation to the programmer. **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.* The answer includes one or more from legal/ethical, benefits, drawbacks for open source **and** proprietary. Alternatively, the answer could have a justified recommendation without clearly referencing the bullet points in the question. **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	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:** Licence features Open source – (usually free), can access/change source code, redistribute Proprietary – purchase at a cost, cannot access/change code Legal and ethical issues: • Both provide copyright • Open source – allows more people to take code and possibly change to resell, or adapt in their own programs to resell or claim as their own (reverse for proprietary) • Open source – allows more people access to the game because there is likely no cost (reverse for proprietary) Benefits and drawbacks: • Open source – wider customer base, more exposure, users can alter to make it better/fix

			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.* The answer is limited to the facts about open source **and/or** proprietary. **0 marks** No attempt to answer the question or response is not worthy of credit		bugs, limited documentation, little financial gain • Proprietary – allows programmer to earn money, gives more control over what happens with the program, usually well tested, more restrictions for copyright, cannot be adapted to meet user needs, Decision: Either would be appropriate, justification needs to be clearly for the scenario

5	**a**	**i**	1 mark for The amplitude of the wave is measured at set intervals	1	2+ ticks = 0 marks
5	**a**	**ii**	1 mark each to max 2 • The number of bits per sample will change // by example e.g. there will be more/less bits per sample • The file size will change // by example e.g. the file size will increase/decrease • There will be a change in the accuracy of each sample/amplitude/sound // by example e.g. more precise amplitudes // by example e.g. a wider/smaller range of amplitudes can be recorded • The quality will change // there will a different amount of distortion // by example e.g. the quality will improve/decline	2	MP3 needs to be clearly a wider range of amplitudes can be recorded i.e. more different values. **Not** that there are more **amplitudes/samples per second.** MP3 – 'more amplitudes can be measured' is BOD, but 'more amplitudes measured per second' is incorrect. BOD 'sound' for 'amplitude' e.g. for MP3 "a larger range of sounds can be recorded."

5	**b**	**i**	No mark for type. Accept the type by example e.g. HDD for magnetic. 1 mark each for each point matching to type given to max 4 Magnetic e.g. • (Usually) cheaper cost to purchase per unit of data • Sufficient/good durability for what is needed • … computer unlikely to move (regularly) // by example • Sufficient/fast speed of access • …no significant delays in storing/reading data • (Long-term) reliable // longevity • …unlikely to need to purchase another //unlikely to break from over-use • High capacity • … e.g. file size of sound files can be large // allows the musician to store files with higher bit depth Solid state e.g. • Cost often equates to magnetic per quantity // not expensive per unit of data • Durable // robust // no moving parts • …so computer can be moved without risk of losing data • Fast **speed of access** of data • … no significant delays in storing/reading data // musician does not have to wait for files to load/store • High capacity // (nearly the) same/higher capacity than magnetic • …file size of sound can be large • Small in physical size • … device is portable // can fit in a smaller type of computer • Produces less sound when running • … so the musician distracted • Requires little/less power (compared to others) • … so running costs are reduced • Drives do not get fragmented files • … drives do not need to be defragged // constant access time	4	MP1 needs to be cost per unit e.g. it costs less per GB than other storage types. Not just 'it is cheap to buy'. Allow reverse argument for each e.g. for magnetic, why they have not chosen solid state. For example: 'magnetic is not as robust but the computer will not be moved' gets 1 mark for the not moving, and 1 mark for solid state's robustness is not required. If there is no type give on line 1. Read the answer to look for a type and then award justification. If there is not type identified anywhere in the answer, 0 marks.
5	**b**	**ii**	1 mark for Optical	1	BOD optic. Do not award an example of optical storage
5	**b**	**iii**	1 mark for 200 000 KB	1	2+ ticks = 0 marks

5	**b**	**iv**	1 mark for the answer 3 GB 1 for working e.g. • 3 * 1000 / 1000 • 3 * 1000 • 3000 / 1000 • 3 / 1000 • 0.003 * 1000	2	Allow 2.9296875 (or approximated) for division by 1024. Allow addition of metadata e.g. 10% added. This can be awarded for both working and answer. Not all of the working needs to be correct to get the working mark. Ignore mention of MB/GB in the working.
6	**a**		1 mark each • **Data/instructions** are fetched from **memory/RAM/primary storage** • **Data/instructions** are stored using the registers // **correct example** of a register storing address/data • **Data/instructions** are decoded // **Data/instructions** are split into opcode and operand • **Data/instructions** are **executed/processed** • **ALU** performs the logical/arithmetic calculations	2	MP4 BOD carried out etc. for executed. Ignore inaccurate references to registers and components (other than MP2 correct example of a register).

6	**b**		1 mark for naming register, 1 for matching purpose • Program counter // PC • **Stores** the **address** of the **current/next** instruction to be fetched // **stores** the **address** of the instruction for the **current/next** FE **cycle** • Memory address register // MAR • **Stores** the **address** of the **current/next** instruction/data to be fetched // **stores** the **address** where data/instruction is to be stored • Memory data register // MDR • **Stores** the **data/instruction** fetched from memory // **stores data/instruction** to be stored in memory // stores the **data/instruction** located in the **memory** location in the **MAR** • Accumulator // ACC • **Stores** the **result** of calculations // **stores data currently** being processed / by example // **stores** the result from the ALU	4	Careful that the purpose is not an action such as fetches, takes, retrieves. Read full purpose and award a correct point Accept • Current instruction register//CIR//Instruction register//IR • Stores the instruction currently being executed BOD memory buffer register for MDR. If there is no register but the register is given in the purpose column, award the purpose if accurate. If the answer in the register column is incorrect, do not mark purpose. For PC and MAR, accept 'pointer' for storing address Accept memory address, memory data
6	**c**		1 mark each to max 3 • Clock speed • Cache size • Number of cores	3	'clock' 'cache' 'speed' 'cores' on its own is NE.

7	a		1 mark each to max 3 • Has a specific purpose // it only performs one/limited task // dedicated to the Follow Me system • Built within a larger device/car • **Dedicated**/specific/its own hardware / sensors • Has a microprocessor • Built-in operating system/software // software is all in firmware/ROM • …it's instructions/operation does not/is hard to change/update • It is a control system // it is automated	3	MP2 BOD reference to it being 'built into' 'something' reasonable
7	b	i	1 mark each to max 2 • Start-up instructions // BIOS // bootstrap // where to find the OS • Firmware // Program/instruction to run the Follow Me system // Instructions for operation • Example of data being stored e.g. the maximum speed, the min distance • Operating System // OS	2	MP2 'programs' on its own is NE MP3, Allow two marks for examples of instructions or data. For example both marks can be given for: 1 – The maximum speed 'Follow Me' can operate 2 – The minimum distance the car in front can be
7	b	ii	1 mark each to max 3 e.g. • Current distance from car in front • Set distance from car in front • Current speed of vehicle • Current speed of vehicle in front • Reading from sensor • Driver actions (e.g. moving wheel/braking) • Direction the car (in front) is travelling (e.g. turning)	3	'speed' or 'distance' on its own is NE BOD reference to a camera taking images of what is in front
7	b	iii	1 mark each to max 2 • Only stores a small amount of data in **RAM** // only stores specific/few items in **RAM** • …unlikely to run out of **RAM** // there is enough space in **RAM** • No secondary storage to use/needed as VM • Few/one program/instructions running at a time // no memory intensive tasks • Dedicated hardware will be optimised for system // **RAM** is designed to meet the system's requirements	2	

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PMT

OCR
Oxford Cambridge and RSA

GCSE (9-1)

Computer science

Unit **J276/01**: Computer science

General Certificate of Secondary Education

Mark Scheme for June 2018

Oxford Cambridge and RSA Examinations

PMT

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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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J276/01 **Mark Scheme** **June 2018**

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
	Cross
FT	Follow through
NAQ	Not answered question
NBOD	Benefit of doubt not given
REP	Repeat
/	Slash
	Tick
TV	Too vague
0	Zero
SEEN	Noted but credit not given

J276/01 **Mark Scheme** **June 2018**

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'.

	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.

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
1	(a)	i	1 mark per bullet to max 2 • For **long term/permanent/non-volatile** storage // storing when the device is turned off • To **store** the videos / data / files • For **transferring** the videos (to another device)	2 AO2 1a (1) AO2 1b (1)	Do not award capacity. Bullet 3 – portable is not enough, needs application. Bullet 2 – must identify the data is stored. For videos accept data or any other term that signifies the data is being stored/transferred e.g. photos/images. Accept any alternative for transfer e.g. sending/exporting.
1	(a)	ii	1 mark per bullet to max 4 Max 3 if only stating features e.g. • Portable • Lightweight • ….e.g. device needs to be carried • Small physical size • …e.g. can fit in a small camera • Durable • No moving parts • …e.g. device is moved so may be dropped // won't be damaged when moving around • Reliable • …e.g. needs to work when out in the 'field' • Sufficient/large capacity • …Videos are large file size // store more videos • Fast **access/read/write** speed • …e.g. the device will retrieve the videos without delay • Efficient power consumption • …e.g. run on battery // longer battery life	4 AO1 1b (1) AO2 1a (1) AO2 1b (2)	Award marks for why solid state is most appropriate, not why others aren't. Award descriptions of portable/durable etc., not looking for key words. Do not just allow can transfer data elsewhere. Fastest without quantifying read/write speed is not enough. Allow: quietest and expansion. Do not award cost. Small on its own is insufficient as it could mean physical or memory size.

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
1	(b)	i	1 mark for working, 1 mark for answer • 1024(1000) / 100 // 10*100 = 1000 • = 10 (videos)	2 AO2 1a (1) AO2 1b (1)	Final answer must be 10, not 10.24

1	(b)	ii	1 mark per bullet to max 6
			• Output asking for file size (in megabytes)
			• Taking number of MB as input
			• Multiplying by 1024 or 1000
			• Multiplying by 1024 or 1000 (may be same line as bullet 3, this must be the final value with no further changes)
			• Outputting the final bytes value…
			• …in an appropriate message
			
			`output "Please enter the file size in megabytes"`
			`input numberMB`
			`numberKB = numberMB * 1024 (or 1000)`
			`numberBytes = numberKB * 1024 (or 1000)`
			`output "There are " & numberBytes & " bytes in " & numberMB & "MB"`
				6
				AO3 2b (6)
					Award bullet 5 even if bullets 3 and 4 are wrong. Do not award if outputting the original input value.
					
					Bullet 4 must be the final calculation to get the mark. If there are any further calculations, or changes to the final bytes value then bullet 4 cannot be awarded.
					
					`Input = value` is incorrect, variable must be on left.
					
					Bullet 6 is dependent on bullet 5.
					
					Input must be stored e.g. `user input` – no mark
					
					Outputs must have `""` around strings, variable identifiers must not have `""`.
					
					If bullet 5 is not given because the variable is in `""`, still award bullet 6 if correct.
					
					Bullet 3 and 4, could be multiplying by 1,000,000 or 1,048,576 (award both bullets).
					
					`numberMB = input("Enter the file size")` would get both bullets 1 and 2.
					
					Concatenation is not required for the final bullet.
					
					`input("Filesize")` will get 1 mark for outputting File size, it will not get the input as there is no variable.

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
1	(c)	i	1 mark per bullet to max 3 e.g. Incremental: • Only the changes need to be backed up • The software/OS/settings are unlikely to have changed between backups • Small number of files likely to be used/edited between backups • Take less time to backup • Each backup will take less memory space to store Full: • Backup all the data/files and software • It might not take a significant time to back up entire system • He might only have a small number of files to be backed up each time • Safer as have more past versions to revert to • User may have changed settings on computer • Faster to restore the backup • Needs to do a full before he can do an incremental	3 AO2 1a (1) AO2 1b (2)	Discussion must match the backup given. Either method is acceptable, marks are awarded for the justification. Allow marks for why the other is not appropriate. If there is no method given, or both, then read the answer and mark their justifications. It must be clearly given which method each point refers to.

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
1	(c)	ii	1 mark for naming program, 2 for description of use e.g. • Encryption software • Scramble/encode/mix up data • …so it cannot be read/understood if intercepted/stolen • Defragmentation • Move free space together • Move files together • E.g. Faster access to files • (Data) compression • Reduce the file size of files // makes files smaller • To use less storage space • Faster transmission • To store more files • Anti-virus / anti-malware • To help protect computer/data against viruses/malware • To scan the computer to look for/quarantine/remove viruses/malware • Disk analysis and repair • Scan disk and look for faults • Prevent loss of data due to faulty disk • Auto-update • Checks Internet for new versions of software/OS • Downloads and installs without user interaction • Firewall • Examine ingoing and outgoing traffic • To help restrict/prevent unauthorised access • …over a network/external source	3 AO1 1a (1) AO1 1b (1) AO2 1b (1)	Must be appropriate to scenario. For encryption, no mark for 'it encrypts data' Do not award: any form of backup or device driver. Do not award: encryption stops data being stolen. Do not award: brand names. But read description. Mark program first. If incorrect 0 marks. If wording is not clear, or terminology not exact but it can be understood, marks can be awarded for description of use. Defragmentation – do not award marks for describing a fragmented disk this is a NAQ.

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
1	(d)		1 mark per bullet to max • Allows free distribution // other people can use/edit his work • **Other people** can redistribute his work • Can **choose** to restrict other people to be able to use/edit/share the videos • Work is still copyrighted // others cannot claim it as their own • No-derivative • …William can set that if others edit it they cannot redistribute it with the edits • attribution • …Can insist e.g. on having his name on it if re-used // referencing // must be credited • Can insist on non-commercial use // others cannot sell/profit from his work // personal use only	3 AO1 1b (1) AO2 1a (1) AO2 1b (1)	"People need to ask to use it" is not enough.

J276/01 **Mark Scheme** **June 2018**

<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 LAN
1 mark per bullet for justification to max 2
• Small distance/geographical area by example e.g. same building/house
• Connected by own hardware/infrastructure
// not connecting through Internet
// no hired/third-party infrastructure
// dedicated connection</td><td>3
AO2 1a (2)
AO2 1b (1)</td><td>Do not allow – in a local area, local needs to be quantified in some way.

No marks for WAN.</td></tr>
<tr><td>2</td><td>(b)</td><td></td><td>1 mark per row
<table><tr><th>Description</th><th>Ethernet</th><th>Wifi</th></tr><tr><td>A wired connection</td><td>✓</td><td></td></tr><tr><td>More likely to be affected by interference</td><td></td><td>✓</td></tr><tr><td>Data can be transmitted at a faster speed</td><td>✓</td><td></td></tr><tr><td>Wireless transmission</td><td></td><td>✓</td></tr><tr><td>Shorter transmission range before data is lost</td><td></td><td>✓</td></tr></table></td><td>5
AO1 1a (5)</td><td>0 mark for row with >1 tick</td></tr>
<tr><td>2</td><td>(c)</td><td>i</td><td>1 mark per bullet to max 2
• Directs packets/data to destination // directs packets/data in a network
• Receives packets/data from the network/Internet
• Forwards packets/data to other computers on the network/Internet
• Connects (different) networks together // e.g. joins home network to Internet
• Has (public) IP address for LAN
• Designates (private) IP addresses to network nodes</td><td>2
AO1 1a (1)
AO1 1b (1)</td><td>Controls flow of data as BOD for bullet 1.

Bullet 1 needs to refer to the router directing the destination e.g. it is making a decision/choice on where to send it.

Bullet 4 - it has to be referring to the connection between the Internet and home network, or forwarding of data between them. Just referring to accessing Internet is not enough.

Do not allow information for data/packets</td></tr>
</table>

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
2	(c)	ii	1 mark per item to max 2 e.g. • Network Interface card / NIC • Wireless access point / WAP • Wireless network interface card / WNIC / wi-fi card • Bridge • Switch • Hub • Repeater // wireless extender/booster • Server	2 AO1 1a (2)	Accept modem, power line adapter, Ethernet **jack** Must be an item of network hardware
2	(d)	i	Domain Name Server // DNS.	1 AO1 1a (1)	Allow Server/service/system
2	(d)	ii	1 mark for each letter in the correct place 1 The request is put into packets 2 **E** 3 The packets are sent across the network 4 **D** 5 **A** 6 If they have not arrived: 7 A timeout is sent to request the packets are resent 8 If they have arrived: 9 **B** 10 **C**	5 AO1 1b (5)	

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Question			Answer	Mark	Guidance
2	(e)		1 mark for naming threat, 1 for description, 1 for prevention. Max 3 per threat e.g. • Virus / trojan / worm / malware • Piece of software/code/a program that replicates itself // causes damage e.g. editing/deleting files • Running anti-virus/anti-malware software // don't download from unknown sources // don't click on unknown links • Spyware / malware / keylogger • Piece of software/code/a program that records actions/key presses and sends this data to a third party for analysis • Running anti-spyware/anti-malware software/firewall • Data interception / passive • Data is sent to another device and is intercepted by a third party • Encryption • Phishing • An e-mail has a link that when clicked directs the user to a fake website that collects personal data • Network policy // firewall • Pharming • A piece of code installed that redirects user to fake website that collects personal data • Anti-malware // firewall • Hacker • Person attempting to gain **unauthorised** access to the network/computers/ data/files // **unauthorised** access and then deleting/editing data/files	9 AO1 1b (3) AO2 1a (3) AO2 1b (3)	Must be relevant to home use i.e. not denial of service, SQL injection. Do not allow adware, spam. Do not allow backup as a prevention – it does not prevent the threat occurring. Do not allow encryption for stopping a hacker. Description must do more than repeat the threat. Read whole response to threat, identify threat first (may not be at the start and may be within description), then look for description. If no threat identified, then no mark for prevention. Allow any example of hacking for hacker e.g. cracking (password), active. But only once. Only award malware once, for virus or spyware e.g. virus identified, then malware identified both can be awarded. Virus, then malware, then spyware, would get a repeat for final spyware. Allow: • Ransomware • Prevents access to your files unless a ransom is paid • Anti-virus/firewall

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
			• Firewall // strong password // biometrics // penetration testing • Brute force attack • Person/software using every combination of passwords to gain access • Firewall//strong passwords • Social engineering • Person being the weak point of the system // by example e.g. any example of deception • e.g. Strong passwords // check validity of sources		

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
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.* **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.* **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material	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>Inhabitants</u> • Connection with the rest of the world • Access to more information • Up-to-date with news • E-commerce • Communication with people • Can be used in schools/for education • Cost (Devices and connection) <u>Businesses</u> • Sell products to wider audience//more customers • Purchase items from wider range/more places • Competitive prices • Tourism can be advertised • Online bookings for hotels <u>Ethical issues</u> • Access to inappropriate/illegal content • Lead to social pressure to be online and get technology • Cost • Introduces digital and social divide • Threats <u>Privacy issues</u> • Tracking of IPs/devices • Social media

J276/01 **Mark Scheme** **June 2018**

Question			Answer	Mark	Guidance
			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		• Unwanted images and videos of people may be put online • Risk of threats e.g. phishing/pharming/virus

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Question			Answer	Mark	Guidance

4	(a)		1 mark per bullet to max 2 per register
			• MAR // memory address register
			• Stores the address/location where data will be **read/written/accessed/fetched**
			// address/location of data/instruction being **processed**
			// address/location of data/instruction next to be **processed**
			
			• MDR // memory data register
			• Stores the data/instruction that is **fetched/read** from memory
			// stores the data that is to be written to memory
			// stores the data/instruction from the address in the MAR
			// data/instruction next to be **processed**
			
			• Program counter
			• Stores the address/location of the next instruction to be run
			// stores the address/location of the current instruction being run
			
			• Accumulator
			• Stores the result of manipulation/process/calculation
				4
				AO1 1a (2)
				AO1 1b (2)
					MAR stores address is not enough for description
					MDR stores the data is not enough for description
					
					Allow:
					• Current instruction register // IR
					• Stores the instruction currently being processed
					
					Accept MBR // Memory buffer register for MDR

4	(b)		1 mark per bullet to max 2 • The number of FDE cycles run per given time/second // the frequency that the clock 'ticks' • 3.8 billion cycles/instructions … • …per second	2 AO1 1b (1) AO2 1a (1)	Do not award: how fast the computer is // speed of CPU 3.8 = 3,800,000,000

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Question			Answer	Mark	Guidance

4	(c)		1 mark per bullet to max 3
			e.g.
			• Software may be designed to run on 1 core and not multiple cores
			// depends on the task(s)
			• …some tasks cannot be split across cores
			• Clock speed also affects speed
			// dual core may have a faster clock speed
			// quad-core may have slower clock speed
			• ….so one task may be run faster/slower
			• RAM size also affects speed
			// Quad-core may have less RAM
			// amount of VM being used
			• Cache size also affects speed
			// Quad-core may have less cache
				3
				AO1 1b (1)
				AO2 2b (2)
					Allow marks for other components that could affect the speed e.g. secondary storage access speed, onboard GPU.
					Award description of concurrent processing.

4	(d)	i	1 mark per bullet to max 3 • VM is used when RAM is full • ...part of the secondary storage used as (temporary) RAM/VM • Data from RAM is moved to the secondary storage/VM (to make space in RAM) • RAM can then be filled with new data • When data in VM is needed it is moved back to RAM	3 AO2 1a (1) AO2 1b (2)	Many candidates are giving disadvantages of VM, or that the computer can now run more programs, which are NAQ
4	(d)	ii	1 mark per bullet to max 2 • More RAM will improve the performance of the computer // More RAM will speed up the access to data • Excessive use can cause disk thrashing … • …which decreases performance • VM is slower to access than RAM direct (because it has to go back to RAM first) • Moving data between RAM and VM takes processor time	2 AO2 1b (2)	Do not award: VM is slower, without quantifying slower at what

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Question			Answer	Mark	Guidance
5	(a)		• An agreement / set of rules / standard • …for how computers should communicate // how data is sent/received/transmitted on a network • Example of what could be agreed in the protocol (e.g. speed / error checking / etc.)	2 AO2 1b (2)	Do not award set of instructions for bullet 1
5	(b)	(i)	1 mark for protocol, 1 mark for description • FTP / file transfer protocol • Uses a client-server model // sends from client to server // sends from server to client	2 AO2 1b (2)	If protocol wrong, no mark for description
5	(b)	(ii)	1 mark for protocol, 1 mark for description e.g. • HTTPS / hyper text transfer protocol secure • **Encrypts** the connection/data // Uses SSL/secure socket layer	2 AO2 1b (2)	If protocol wrong, no mark for description
5	(c)		1 mark for IMAP, 1 mark for SMTP. IMAP • Retrieves/accesses/downloads (a copy of an) e-mail • Allows synchronisation/management of account SMTP: • Sends/forwards/transmits e-mail	2 AO1 1b (2)	Marks are for IMAP retrieving, SMTP sending. At this stage do not worry about where they are going. Question does not refer to email, so response must in some way refer to email/message. Sends/receives data is not enough.

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GCSE (9–1)

Computer Science

J276/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

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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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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

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J276/01 Mark Scheme November 2021

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'.

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	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.

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Question			Answer	Mark	Guidance
1	a		1 mark for each completed space ROM stands for **read** only memory. This stores the **start-up** instructions for a computer and cannot be **changed**. RAM stands for **random** access memory. This stores the instructions and **data** that are currently being used. If the computer does not have enough RAM to run a process it can makes use of **virtual** memory. RAM and ROM are both examples of **primary** memory. Memory located close to the processor that allows faster access than from RAM is called **cache** memory.	8	**read** **start-up** **changed** **random** **data** **virtual** **primary** **cache**
1	b	(i)	• CPU performs the FDE cycle • Process **instructions**	1	
		(ii)	1 mark per bullet to max 2 • Single core means there is only **one processor** • 2.5Ghz means it can run 2.5 billion FDE cycles per second	2	MP1 BOD single processor Allow instructions for MP2
1	c		1 mark each • PC • MAR • MDR • Accumulator	2	Accept other correct registers (e.g. CIR, IR) Read first answer on each line
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	

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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.* Covers one from ethical, legal and privacy. May only be positive/negative. **0 marks** No attempt to answer the question or response is not worthy of credit		

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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

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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

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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	

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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	

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<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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GCSE

Computer Science

J277/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2023

Oxford Cambridge and RSA Examinations

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OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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J277/01 **Mark Scheme** **June 2023**

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the scoris messaging system, or by email.

5. **Crossed Out Responses**
   Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

   Rubric Error Responses – Optional Questions
   Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

   Multiple Choice Question Responses

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When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
   - there is nothing written in the answer space or no valid attempt at an answer (e.g. "I don't know")

   Award Zero '0' if:

   - there is an attempt at an answer that is not worthy of credit (this includes text and symbols).

   Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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8. The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response: Not applicable in F501
    a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
    b. **To determine the mark within the level**, consider the following:

Descriptor	**Award mark**
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

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11. **Annotations**

Annotation	Meaning
A	Omission mark
BOD	Benefit of doubt (must be accompanied with a tick)
	Cross
FT	Follow through (must be accompanied with a tick)
NAQ	Not answered question
NBOD	Benefit of doubt not given
REP	Repeat
	Tick
TV	Too vague
SEEN	Blank pages, pages with no annotation, no attempt to answer the question, page seen on QER
L1	QER Level 1 mark awarded
L2	QER Level 2 mark awarded
L3	QER Level 3 mark awarded

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12. Subject Specific Marking Instructions
Mark scheme conventions:

- Each mark point is worth 1 mark unless stated otherwise
- Each mark point can only be awarded once
- A word/phrase that is underlined needs to be exact in the answer to award the mark point
- A word/phrase that is **bold** needs that concept to be in the answer (but can be given in multiple ways) to award the mark point
- 3 dots at the end of one mark point and at the start of the next mark point mean that the second mark point cannot be awarded without the first being awarded, unless the mark scheme states otherwise (for example a reasonable attempt with some inaccuracies)
- 3 dots at the start of a mark point, without 3 dots at the end of the mark point above, means the sentence carries on and there is no dependency
- Any text in brackets is not required to gain the mark point
- Single / means alternative word
- Double // means an alternative statement that is acceptable for the same mark point
- Enlarged font is used for visibility reasons only

Annotating scripts:

- Blank pages at the start of the script need SEEN annotation
- Any questions answered elsewhere (e.g. on the first blank pages, separately on the page) need to be linked within RM Assessor and annotated with ticks/crosses/SEEN as appropriate
- 1 tick for every mark awarded, if a question is given 3 marks there must be 3 ticks (apart from QER question)
- A BOD or FT annotation needs to be accompanied by a tick
- QER question 6 – One annotation from: L1, L2 or L3, according to the level awarded, the page not annotated with the level needs a SEEN annotation. Do not include any ticks, crosses or other annotations on this question – other than SEEN and one from: L1, L2 or L3
- Any answers with no candidate response need a SEEN annotation and NR entered as the mark.
- Any questions where the candidate has not attempted the question e.g. answered 'don't know' need a SEEN annotation and NR entered as the mark.
- All questions must be annotated throughout the marking process.

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>1</td><td>a</td><td></td><td>1 mark for:
• Binary is used because computers are made of switches that can only be on or off (box 3)</td><td>1</td><td>Accept cross or other indication as long as clear which one they intend.
2+ ticks = 0 marks</td></tr>
<tr><td>1</td><td>b</td><td></td><td>1 mark for each completed box
<table><tr><th>Denary</th><th>8-bit binary</th><th>Hexadecimal</th></tr><tr><td>7</td><td>00000111</td><td>7</td></tr><tr><td>49</td><td>00110001</td><td>31</td></tr><tr><td>102</td><td>01100110</td><td>66</td></tr><tr><td>244</td><td>11110100</td><td>F4</td></tr></table></td><td>4</td><td>Must be 8-bits.

Ignore case in hex.

Ignore calculations in answer box.</td></tr>
<tr><td>1</td><td>c</td><td></td><td>1 mark for:
• 200MB (box 3)</td><td>1</td><td>Accept cross or other indication as long as clear which one they intend.
2+ ticks = 0 marks</td></tr>
<tr><td>1</td><td>d</td><td></td><td>1 mark for both boxes:
• 4 500 000 bytes (box 1)
4.5 MB (box 3)</td><td>1</td><td>Accept cross or other indication as long as clear which one they intend.
1/3+ ticks = 0 marks</td></tr>
<tr><td>1</td><td>e</td><td></td><td>1 mark each:
• Answer (1) 0 0 0 0 1 1 1 1
• Correct working e.g. carrying (might be above, below etc.)
0 1 1 1 0 0 0 1
1 0 0 1 1 1 1 0
0 0 0 0 1 1 1 1
carries: 1 1 1</td><td>2</td><td>Do not award marking for converting each number to denary and adding them together. If the carries are present, and converting to denary is present – award the carries (conversion can be used to check their answer).
Marks are not dependent.</td></tr>
</table>

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1	**f**		1 mark each: • Left shift • 3 places	2	

PMT

J277/01 **Mark Scheme** **June 2023**

<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>i</td><td>1 mark for each protocol
<table><tr><th>Task</th><th>Protocol</th></tr><tr><td>Requesting a webpage from a web server</td><td>HTTP // HTTPS</td></tr><tr><td>Entering a username and password to access their bank account</td><td>HTTPS</td></tr><tr><td>Downloading a text document from a web server</td><td>FTP // HTTP // HTTPS</td></tr><tr><td>Checking for new emails in their inbox</td><td>IMAP // POP</td></tr></table></td><td>4</td><td>Mark first answer in each box.

Allow full name to be written e.g. file transfer (protocol).

Accept POP3 or any other version</td></tr>
<tr><td>2</td><td>a</td><td>ii</td><td>1 mark each to max 2:
• Each layer is independent // layers are not reliant on other layers
• One layer can be changed without affecting the others // a layer can function without needing/changing/impacting any other layer // self-contained
• Separates tasks so they can be developed independently
• A developer can focus on only one layer // developer can specialise
• Allows for standards for individual tasks/layers to be developed // for compatibility
• Manufacturers can develop hardware to fit into one particular layer
• To group together similar protocols</td><td>2</td><td>Max 1 in each answer space</td></tr>
<tr><td>2</td><td>b</td><td>i</td><td>1 mark from:
• Uses dedicated/own/internal hardware
// no external/third party hardware/infrastructure
// computers use MAC addresses to communicate within the LAN</td><td>1</td><td></td></tr>
</table>

PMT

J277/01			Mark Scheme		June 2023
2	**b**	**ii**	1 mark each to max 4: e.g. • Allows **more** devices to connect … • …for example televisions, mobile phones • Easy to connect (devices) // Easier to setup (wireless connections) // By example e.g. easier for guests to connect their devices • Home is likely small area • … so short distance wireless is sufficient • Devices can move around // can use devices in different areas // can connect from anywhere in the house // can use where wires don't reach // can access from a larger area (than wired) • … by example e.g. student is using a laptop so does not need to be tied to one place // by example e.g. they don't have to disconnect before moving // e.g. they can stay connected whilst moving • Cheaper to **purchase**/**install**/**setup** for new devices // no cost for (new/replacement) wires/hardware • …because no **additional**/**fewer** wires are needed • Fewer trip hazards from trailing wires // reduce risk of damage to cables // fewer cables to damage • More compatible // some devices only have wireless connections	4	Easier/cheaper on their own is NE
2	**b**	**iii**	1 mark each to max 2: e.g. • Prone to interference // by example • Limited range of signal • Slower rate of transmission // less bandwidth // reduced network performance// increased latency // BOD slower connection // more users reduces rate of transmission / bandwidth /performance etc. • Increased risk of **security** concerns // by example e.g. A hacker could connect to the wireless connection • Less stable connection • Higher chance of collisions // Higher error rate	2	MP3 needs to say what is slower / decreased e.g. It's slower, is NE Mark first drawback in each answer space. Less reliable is TV on its own for MP 5

J277/01 **Mark Scheme** **June 2023**

<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 each completed space

A character set stores all of the characters that the computer can represent. Each character is given a unique/different binary code.
Lower-case and upper-case letters in a character set are given unique/different/similar binary codes.
One example of a character set is ASCII. This character set uses 8 bits for each character. If the ASCII value for the character 'F' is 70 Then the ASCII value for the character "L" is 76.</td><td>5</td><td>Award the same term used multiple times if used correctly</td></tr>
<tr><td>3</td><td>b</td><td>i</td><td>1 mark:
• Data about the data/image/file</td><td>1</td><td>Question is for a definition, not an example.
If the definition is not clear, for example details about the image, information about the image – this is NE, but read the example to see if it clarifies. For example: 'Information about the image, such as the number of pixels' give a BOD.

Data could be properties/characteristics.</td></tr>
<tr><td>3</td><td>b</td><td>ii</td><td>1 mark each:
• First row: red red purple
• Remainder correct and in correct order

<table><tr><td>red</td><td>red</td><td>purple</td></tr><tr><td>blue</td><td>green</td><td>blue</td></tr><tr><td>purple</td><td>purple</td><td>purple</td></tr><tr><td>red</td><td>green</td><td>blue</td></tr></table></td><td>2</td><td>Ignore case/spelling as long as legible.

If a candidate has completed the table in the incorrect layout e.g. right to left, or bottom to top, then award MP2 as a FT if they have done it all correctly.</td></tr>
<tr><td>3</td><td>b</td><td>iii</td><td>16</td><td>1</td><td>Accept any calculation that equates to 16 i.e. 2^4</td></tr>
</table>

J277/01 **Mark Scheme** **June 2023**

3	**b**	**iv**	1 mark each to max 2: • The **quality** of the image can be improved • The **file** size will increase // takes up more **storage** space // image has/requires/takes up more data • The number of colours that can be represented/used will increase // BOD more colourful	2	Do not award higher resolution, image size increases, clearer image (NBOD) more detailed image (NBOD). Closer to original is NE on its own because there is not an original image in this context. Mark first answer in each answer space.

3	**c**	**i**	1 mark for lossless
			
			1 mark each to max 2 for justification:
			e.g.
			• Lossless will not remove any **data**
			// No **data** is lost with lossless
			// **File**/**data** can be fully reconstructed back to the original
			• Text files require all data to open/be used/work
			// text files will not work if any data is lost
			// lossy cannot (usually) be used on text files
			// none of the required characters / words / spaces / case / formatting / information would be lost
			// the text will remain accurate
			// the text will not have changed meaning
			// the text will still make sense
				3	Do not award an example of lossless for 1st mark (e.g. RLE), but FT for justification.
					
					Do not FT for lossy.
					
					Accept reverse for answers e.g. Lossy will remove data.
					
					If compression type is missing, read justification and if clearly stated which type is used then award justification.
					
					MP1 requires reference to the data (or equivalent) not information.
					MP2 requires reference to the text file context and information is allowed.
					
					If not valid compression – 0 marks.

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3	**c**	**ii**	1 mark for lossy 1 mark each to max 2 for justification e.g.: • Will reduce the **file size more/significantly** (than lossless) • Image will only lose **quality** // changes may **not be noticed** by the user // remove **unnoticeable/unnecessary** detail/content	3	Do not award an example of lossy for 1st mark (e.g. reduce resolution), but FT justification. Do not award lossless but FT for justification for lossless: e.g. • Quality/detail of the image can be retained • No data will be lost (permanently) • File size may still be a substantial reduction If compression type is missing, read justification and if clearly stated which type is used then award justification. Do not award how the file can be compressed e.g. reduce number of colours – unless they also state that this change will not be noticed. MP1 it compresses the file more is NE – compression is in the question, the candidate needs to explain what this means. If not valid compression – 0 marks.

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J277/01 **Mark Scheme** **June 2023**

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>4</td><td>a</td><td></td><td>1 mark for each row

<table><tr><th>Threat</th><th>Anti-malware</th><th>Penetration testing</th><th>Encryption</th><th>Firewall</th></tr><tr><td>Spyware</td><td>✓</td><td></td><td></td><td>(✓)</td></tr><tr><td>Brute-force attack</td><td></td><td>(✓)</td><td></td><td>✓</td></tr><tr><td>Data interception</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>SQL injection</td><td></td><td>✓</td><td></td><td>(✓)</td></tr></table></td><td>4</td><td>(✓) can be present, or not</td></tr>
<tr><td>4</td><td>b</td><td></td><td>1 mark for threat
1 mark each to max 2 for description
e.g.
• Threat: Social engineering
• Using deception to manipulate users
• …to gain personal data

• Threat: Shoulder surfing (threat or expansion)
• Watching a person entering a password
• …and using it to access an account

• Threat: Phishing
• Fake emails sent to person // click on link from fake email
• Person sends personal data // gives away personal data

• Threat: Pharming
• Software that redirects user to fake website // use of a fake website
• Person enters personal data // gives away personal data

• Threat: Denial of service // DOS // DDOS
• Multiple requests sent to a server (simultaneously) // server is flooded with requests
• More requests than the server can process // uses all of the bandwidth available
• Server cannot respond // server crashes/denies access // stops access to a network // slows access to a network

• Threat: Hacker
• Person gaining unauthorised access to a system/account</td><td>3</td><td>If threat is clearly wrong do not FT.

If no threat given, read description for name of threat. If no name, do not award.

If threat is vague award matching description.

Allow social engineering as the threat – naming and description of phishing/pharming/shoulder surfing in the description.

Ransomware – MP3 cannot be awarded for 'ransom' on its own without reference to it being paid.

For actions that the malware/virus etc. can carry out – award any feasible action.</td></tr>
</table>

J277/01			Mark Scheme		June 2023
			• To delete/damage/access data • Threat: Virus/malware • Software that replicates/spreads • Fills disk space • Deletes/corrupts data // allows unauthorised access • Threat: Trojan • Malware disguised as legitimate software • Once installed acts as a virus // by example of action e.g. deleting files / allows unauthorised access • Threat: Worm • Software that replicates across a network • Uses up all the bandwidth • Threat: Ransomware • Encrypts/corrupts/locks access to data • Cannot access data without **paying** a fee/money // **pay** fee/money to get them back/decrypted // Cannot access data without meeting demands • Threat: Physical threat // by example • Damage to hardware • Deletes/corrupts data		

5	**a**	**i**	1 mark each
			Primary
			• to store (active) **data/instructions/software/OS** that the **processor** needs to **access**
			// without primary the computer won't be able to start up/work
			// (ROM) so the start-up instructions are not deleted when the computer turns off
			// (RAM) to store the **currently** running **data/software/instructions**
			// (Cache) to store **frequently** used **data/instructions**
			
			Secondary
			• to store **data/files long-term/permanently**
			// without secondary the user's files will not be stored when the power is turned off
			// store **data** not currently being used
				2	Question is not what they store, but why they are needed.
					
					Secondary NBOD 'to backup data' without reference to the long-term/permanence

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5	**a**	**ii**	1 mark for device, 1 mark for data • Hard drive // SSD // USB (memory) stick // Flash memory card // CD // DVD etc. • E.g. Images created // documents // software // files // data moved from RAM to virtual memory	2	Allow any secondary device. BOD 'optical disc' Question asks for device not type of device e.g. magnetic/optical/solid state is NE. Award example even if incorrect secondary storage. USB on its own is NE

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<table>
<tr>
<td>5</td>
<td>a</td>
<td>iii</td>
<td>1 mark for each row.

<table>
<tr><th>Statement</th><th>True (✓)</th><th>False - correct the statement</th></tr>
<tr><td>A section of primary storage is partitioned to act as virtual memory</td><td></td><td>A section of secondary storage is partitioned to act as virtual memory</td></tr>
<tr><td>Data from ROM is transferred into VM</td><td></td><td>Data from RAM is transferred into VM</td></tr>
<tr><td>VM is needed when RAM is full, or nearly full</td><td>✓</td><td></td></tr>
<tr><td>Data from VM is transferred back to secondary storage when needed</td><td></td><td>Data from VM is transferred back to RAM when needed</td></tr>
</table>
</td>
<td>4</td>
<td>Allow a description of the error in column 2, e.g.
in row 1: 'primary should be secondary'

Accept HDD/SSD for secondary storage for the 1st row.

Do not accept primary for RAM (rows 2 and 4).</td>
</tr>
<tr>
<td>5</td>
<td>b</td>
<td></td>
<td>1 mark from:
• Performs housekeeping actions
• Monitor / manage / maintain a computer system
• Help the computer run smoothly/efficiently
• To diagnose/fix/identify problems with a computer system</td>
<td>1</td>
<td>Do not award example on its own</td>
</tr>
</table>

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5	**c**	**i**	1 mark for identification: • Artist's computer // computer uploading the images // BOD The artist 1 mark each for justification to max 2: e.g. • Sends the files/data for storage/to the **host**/web **server** // the files are stored on the web **server** • Performs the user's actions … • .. and sends the results to the web **server** • Sends a **request** to the web **server**… • … to **store**/**upload** its files • It does not store data for others to access • Confirmation of upload/error is received (from server) for display	3	Incorrect computer, do not award justification. Be careful the justification is talking about the upload of images to the web server, not the download. Accept host for web server. If 'user's computer' is given for identification, this is NE – read on for justification. If 'user viewing the website' or similar is given this is incorrect.
5	**c**	**ii**	1 mark for identification: • Web server 1 mark each for justification to max 2: e.g. • The images/data are stored on / uploaded to / sent to / hosted on the web server • Web server receives a request (from the artist's computer to upload the images) • Web server executes/responds to the request // Web server is doing the processing/handling the (request to) upload • Web server returns confirmation/error of the processing/upload	3	If computer is incomplete or inaccurate e.g. server/website instead of web server. Do not award computer, but award justification. Allow FT in justification if the same inaccurate term is used, for example 'website' is given as computer (NE), but justification is: 'images are sent to the website' (FT for website instead of web server). Incorrect computer, do not award justification.

J277/01			Mark Scheme		June 2023
5	d	i	1 mark each: e.g. • Authors can earn money • …by selling for a fee // using licences to stop unauthorised use • No-one can see the code • …users cannot edit/change the software // by example inserting malware • …so it cannot be copied/resold/shared • More **control** over intellectual property // by example e.g. restrict users, restrict what can be done with the software without permission	4	Benefit is to artist and programmer – not user. Mark the answer as a whole. Do not award reference to ownership/copyright because both allow copyright of the code/program.
5	d	ii	1 mark for point, 1 for expansion: e.g. • Users can **view**/**edit** the (source) code // Users can **edit** the program/software • …to **tailor**/**improve**/**adapt** it to do what they need/want • …so errors can be fixed (by anyone) • …users can learn how the software works • Freely accessible • …do not have to pay • …can redistribute … • …with changes	2	Benefit to users not artist and programmer
6			**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.	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:** Some points may cover more than one 'issue'. Legal issues: • DPA needs to be followed or company could be fined e.g. Customers informed the system is used Data held for specified

J277/01			Mark Scheme		June 2023
			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 and most are 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.* **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		time/reasons Data kept secure • Centre is private property so customers can choose not to enter • Can be used to identify people committing crimes e.g. theft, used as evidence, make sure the correct people are caught. Ethical issues: • Users feel safer because they know any actions are being monitored and help/action will be taken if needed • If users have not done anything then there is no reason to be tracked/recorded so should not impact them • Users feels unsafe because they are being watched • Users may be unaware they are being recorded - need to be informed, give consent • Users do not know where the videos/data about them and their movements is stored/how it is used - DPA reference Privacy issues:

PMT

J277/01			Mark Scheme		June 2023
					• Users may feel it is an invasion of privacy • Users are in a public place and can be legally recorded by anyone anyway • Users may feel like they are being watched all the time • Users have not given their permission to be tracked • Users may not know the system exists

J277/01 **Mark Scheme** **June 2023**

Question			Answer	Mark	Guidance
7			1 mark for example: e.g. • Auto lights • Auto window wipers • Sat nav // GPS • Airconditioning // climate control • Radio/entertainment/infotainment system/media system • Lane assist • Engine management system • Auto-park • Cruise control • Auto-brake • Follow-me • Dashcam 1 mark each to max 2 for explanation. • **Limited** functions // by example e.g. the system **only** checks the light and turns lights on/off • **Dedicated** microprocessor // by example e.g. there is a microprocessor that is only checking the lights • Hard to change function // by example e.g. the user cannot make the light system do any other role	3	Allow anything that could be reasonably within a car. If example is not clear if it's an embedded system, read explanation for justification e.g. hazard lights – could be embedded if they are activated automatically when the car crashes. Award the example in the explanation if this occurs. If justification is generic features of an embedded system max 1 for explanation. Do not award 'built into the car/larger machine' because this is in the question.

PMT

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Question 5 (a)

5 A software development company wants to protect their computer systems and data from unauthorised access.

(a) Identify **two** methods of physical security that the company could use to protect their computer systems.

1 .....

.....

2 .....

.....

[2]

Some candidates gave software-based security methods in response to this question instead of physical. The most common responses included locking doors, CCTV and guards to physically prevent access to a computer.

Question 5 (b)

(b) Identify **and** describe **two** software-based security methods that the company can use to protect their computer systems and data.

Method 1 .....

Description .....

.....

.....

.....

Method 2 .....

Description .....

.....

.....

.....

[6]

Many candidates answered this question well Strong responses correctly identified software-based security methods; most commonly anti-malware/anti-virus, firewalls, passwords and encryption.

The descriptions of anti-malware, anti-spyware and anti-viruses were often stronger than those that gave firewalls and encryption.

Question 5 (c)

(c) Tick (✓) **one** box on each row to identify the legislation that would cover each of the given events.

Event	The Data Protection Act (2018)	Computer Misuse Act (1990)	Copyright Designs and Patents Act (1988)
A company transmits personal data to another company without the individual's permission.			
A school accidentally publishes their students' addresses on the school website.			
The interface for a piece of software is replicated by a rival company.			
A user leaves a computer logged on and another person leaves them a message on their desktop.			
A student guesses their teacher's password and accesses their computer account.			

[5]

This question was answered well by many candidates who correctly identified the legislation that applied to each event.

Question 5 (a) (i)

5 An artist has a computer that they use to create images.

Their computer has both hardware and software.

(a) The hardware includes primary and secondary storage.

(i) Explain why a computer needs both primary **and** secondary storage.

.....

.....

.....

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

Some candidates found this question challenging and often gave examples of each type of storage instead of answering why both are required. Some candidates were able to accurately describe the purpose of primary storage as storing currently running data and software.

Misconception

A common misconception was that secondary storage is used when primary storage is full, or that it is only used as a backup.

Question 5 (a) (ii)

(ii) Give **one** example of a secondary storage device that the artist's computer will have **and** an example of the data that will be stored on it.

Secondary storage device .....

Example data .....

.....

[2]

Candidates were required to identify a secondary storage device. Some responses identified a type of storage media (for example magnetic) instead of identifying a device (for example hard drive). Some responses gave RAM or ROM as a secondary storage device. These responses were incorrect.

The example data varied but many responses were able to identify the storage of files, the images or software.

Question 5 (a) (iii)

(iii) The computer has Virtual Memory (VM).

The table has four statements about VM. Not all of the statements are correct.

Tick (✓) the **True** column for the statements that are correct.

Re-write any statement that is incorrect in the **False** column by changing the statement to make it true.

Statement	True (✓)	False – rewrite the statement to make it true
A section of primary storage is partitioned to act as virtual memory		
Data from ROM is transferred into VM		
VM is needed when RAM is full, or nearly full		
Data from VM is transferred back to secondary storage when needed		

[4]

In this question candidates needed to consider each statement, identify whether it was true or false and if it was false re-write the statement about virtual memory to make it true.

Candidates commonly identified the third statement as being true.

The first statement was often correctly altered to identify that secondary storage was used. The second statement was sometimes changed correctly to RAM, but at other times was changed to secondary storage.

The final statement was often changed to primary storage, which was not enough because primary storage would include ROM and cache, therefore not being precise enough to describe how VM works.

Question 5 (b)

(b) The computer has an operating system and utility software.

State the need for utility software in a computer.

.....

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

Some candidates gave an example of utility software and described the purpose of that software instead of utility software in general. For example, a candidate gave defragmentation, or file management as the need.

Question 5 (c) (i)

(c) The artist uploads images to be displayed on a website. This is a client-server relationship.

(i) Identify the computer that is acting as the client in this scenario **and** justify your choice.

Client computer .....

Justification .....

.....

.....

.....

[3]

Many responses identified the artist's computer as being the one that is acting as a client.

Fewer responses were able to justify this, for example they described a different scenario, such as downloading the images to view the website, instead of the given scenario of the client uploading the files.

Exemplar 2

Client computer ..... Artist's Computer .....

Justification ..... The Artist's Computer is .....
..... requesting a response for .....
..... uploading images by the website .....
.....

[3]

In this response the candidate has identified the correct computer. The justification states that it is requesting a response, but not where this response is from, and then that the images are uploaded to the website when in this scenario they should be referring to the server in the client-server relationship.

Question 5 (c) (ii)

(ii) Identify the computer that is acting as the server in this scenario **and** justify your choice.

Server computer .....

Justification .....

.....

.....

.....

[3]

Fewer candidates were able to accurately identify the server in this scenario.

Many candidates identified the website as a server when a website is not a computer.

Some candidates who identified the webserver were also able to justify their choice by identifying the actions it was performing in the scenario.

Exemplar 3

Server computer website server

Justification the website server receives and processes data and does not send it back

The response in Exemplar 3 has correctly identified the webserver as the computer. They have also identified that this server (the computer) receives the data and processes the data.

Question 5 (d) (i)

(d) The artist is working with a programmer on the development of a new piece of software.

The software will allow users to edit images on devices such as mobile telephones.

They are considering releasing the software as open source instead of proprietary.

(i) Describe **two** benefits to the artist and programmer of releasing the software as proprietary.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

This question required candidates to consider the benefits to the developer of releasing the software as proprietary.

A common error was describing the benefits to the users, for example they know the software has not been tampered with and that there is lots of support.

The most common responses included the ability to earn money from selling the software and retaining control due to no-one else being able to access the source code.

Question 5 (d) (ii)

(ii) Describe **one** benefit to the users of releasing the software as open source.

.....

.....

.....

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

This question required candidates to consider the benefits to the users of the software being released as open source.

Many candidates were able to accurately identify that the source code comes with the software, and this allows the user to edit it to meet their needs.

Question 6*

6* A shopping centre has a security system that includes CCTV cameras to record activities in the centre. The security system is being upgraded to include the use of facial recognition to identify, track the movements of and record individuals throughout the shopping centre.

Discuss the positive and negative impacts of this upgrade including:

- ethical issues
- privacy issues
- legal issues

.....

.....

.....

.....

.....

..... **[8]**

The quality of written communication required a balanced discussion of the positive and negative impacts of including facial recognition with CCTV cameras in a shopping centre.

Some responses gave strongly negative arguments with little, if any, consideration for the positive impacts. Some candidates also chose to focus on the introduction of CCTV cameras, where the question states there are already CCTV cameras and the discussion is about the upgrade to facial recognition.

The more successful responses considered the ethical, privacy and legal issues one at a time and identified the positive and negative impacts (where applicable) for each of these three sections. These responses were usually well structured and had a balanced discussion before leading to justified conclusions.

Some successful responses included bullet points and table structures to help the candidates structure their response. These were often thorough and included detailed discussions.

Some of the less successful responses focused on people not wanting to be watched by CCTV cameras, or that people would misuse the CCTV cameras. The CCTV cameras were already in existence and therefore this was irrelevant to the context of the question.

More successful responses considered the storage of the tracked videos and how this could lead to data privacy issues. These responses also discussed how shops could use the stored data to analyse where people go in shops to identify areas where they could put more adverts.

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Examiners' report

COMPUTER SCIENCE

J277

For first teaching in 2020

J277/01 Summer 2024 series

Version 1

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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 OCR.

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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.

There were a large number of candidates who took this examination and produced a range of responses across the questions. Candidates were often able to demonstrate their understanding of key elements and express these succinctly. Some candidates found the requirements of application more challenging and gave generic responses without consideration for the scenario.

To do well in this examination candidates needed to recall knowledge about computers, hardware, network and storage, as well as consider how these related to the given scenarios. In the quality of extended response question candidates had to consider the different licence options and how they applied to the given scenario, explaining the benefits and drawbacks of both open source and proprietary software and justifying which they would recommend.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• applied their understanding to scenarios when given in the question • gave a recommendation in Question 4 and justified this decision • used examples to help justify or explain their points • planned their response to Question 4 to make sure all requirements in the question were covered.	• gave short responses that were ambiguous as to what was meant, for example 'core' instead of the number of cores. • provided points on a topic without consideration of the scenario and without linking responses to the question.

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Question 1 (a)

1

(a) The following table has either the binary or denary value of 3 numbers.

Complete the table by converting the 8-bit binary number into denary and the denary number into 8-bit binary.

8-bit Binary	Denary
11110000	
	105
00011110	

[3]

Candidates were often able to correctly convert the numbers between the two forms. The conversion from binary to denary was most commonly accurate with more candidates inaccurately converting from denary to binary.

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Question 1 (b)

(b) Complete the table by writing the answer to each statement.

Statement	Answer
The smallest denary number that can be represented by a 4-bit binary number	
The largest denary number that can be represented by a 6-bit binary number	
The maximum number of different colours that can be represented with a colour depth of 7-bits	
The minimum number of bits needed to represent 150 different characters in a character set	

[4]

This question required candidates to consider the storage of denary numbers in binary in ways other than converting them. Candidates commonly gave the correct smallest denary number, although a common error was giving 1 instead of 0. Some candidates used 7-bit or 8-bit binary numbers for the second response or gave the next value of 64. Candidates found the third response more challenging with many giving 256 for an 8-bit binary number or giving the largest value of 127. The final response had the greatest variance of answers ranging from 1, 2 up to 16 or even 32.

Question 1 (c)

(c) Show the result of a left binary shift of 4 places on the binary number 00001111.

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

Candidates often gave the correct response by shifting the digits accurately. Some candidates did not shift the correct number of places, for example moving 3 places.

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Question 1 (d)

(d) Describe how to convert a 2-digit hexadecimal number into denary.

Use an example in your answer.

.....

.....

.....

.....

.....

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

Candidates that did well on this question used the example to show how they converted a value from hexadecimal to denary. They included annotations to show what they were doing at each stage. Candidates often chose a hexadecimal value that included a letter. Some candidates chose hexadecimal values that were straightforward to convert, for example A0 where they multiplied 16 by 10 and then added 0. Some candidates chose a more complicated calculation and did not always calculate the correct result.

Question 1 (e)

(e) Add these two 8-bit binary numbers using binary addition.

Show your working out.

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

[2]

Most candidates attempted to show their working, commonly by including the carries in an appropriate place. Where the working was correct the answer was also often accurate. Some candidates converted the binary numbers to denary, added them and then converted the result back into denary. This method allowed them to get the answer but did not gain the working marks.

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Question 2 (a) (i)

2 An airport has computers that are connected together on a Local Area Network (LAN).

(a) Each computer has an IP address and a MAC address.

(i) Give **one valid** example of an IPv4 address and **one valid** example of an IPv6 address.

IPv4 .....

.....

IPv6 .....

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

Many candidates found this question challenging with few candidates giving valid IP addresses. IPv4 was more commonly accurate, although a common error was giving numbers greater than 255.

Few candidates were able to give an IPv6 address. Common errors including giving 6 groups of numbers and separating each group with a full stop.

Question 2 (a) (ii)

(ii) Describe the format of a MAC address.

.....

.....

.....

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

The most common responses given marks included identifying that it is usually in hexadecimal and that the groups are separated by colons or hyphens. Some candidates identified the two separate parts of the MAC address.

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Question 2 (b) (i)

(b) The airport currently has wired connections in their Local Area Network.

(i) Describe **two** benefits to the airport of using wired connections in their network.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

Candidates were often able to identify benefits of wired connections but did not include application to the airport. For example, identifying that data was more secure but then repeating this same point by saying data is less likely to be intercepted. To gain the extra marks candidates needed to consider why each point was important in the airport, for example security is important due to the sensitive or private data that is being transmitted around the airport, or the high risk data that could potentially interfere with flights.

The most common benefits included the faster transmission speed and the increased security.

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Question 2 (b) (ii)

(ii) Explain the reasons why the airport should also allow the network to be accessed using a wireless connection.

.....

.....

.....

.....

.....

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

In this question candidates needed to consider why wireless connections should also be allowed. Some candidates inaccurately took this as instead of wired and explained why this should be used instead, for example because they won't need any cables in the airport. A common response was that wireless was cheaper than wired, when there was already a wired connection so adding a wireless connection as well would be an extra cost instead of saving money.

Common responses included the ability to move around and stay connected, as well as the larger number of devices that could connect. Some candidates identified that devices may not have ports that allow for a physical wired connection.

The stronger responses included direct application to the airport, for example identifying the need for staff to respond to problems whilst in different areas of the airport such as tracking luggage or communicating problems.

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Question 2 (c) (i)

(c) One office in the airport has five computers connected to one switch. There are two printers in the office that can be accessed by all computers.

The computers are connected using a star topology.

(i) Draw a diagram to show how the five computers, switch and two printers are connected in a star topology.

[3]

Many candidates were able to draw a diagram that included the five computers, the switch and the two printers. Some candidates did not label these items, instead drawing eight boxes without identify which device each one represented.

Candidates often joined these devices to the switch, with printers occasionally being connected to other computers that were then connected to the switch. Some candidates did not identify the central device, or incorrectly included an extra central device such as a router or a server.

Some candidates then included extra connections that created a mesh network instead of a star topology.

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Question 2 (c) (ii)

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

Benefit .....

.....

Drawback .....

.....

[2]

Candidates were often able to give an appropriate benefit, most commonly that it was easier to add a new computer to the network. Candidates also commonly identified the drawback that the network is dependent on the central device.

Question 2 (c) (iii)

(iii) Describe the role of the switch in the star topology.

.....

.....

.....

.....

.....

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

Candidates commonly identified that the data from each computer in the network is sent directly to the switch, as well as this data then being sent to the destination. Some candidates confused a switch with a hub and identified that the data was sent to all devices connected to it.

Some of the stronger responses identified how the switch records the MAC addresses of devices connected to it and used these to identify which device the data needed to the transmitted to.

Misconception

A common misconception was that a switch performed the same role as a server, with candidates incorrectly identifying that the switch stored the data for devices in the network and that the switch provided services to the connected devices.

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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.

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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.

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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.

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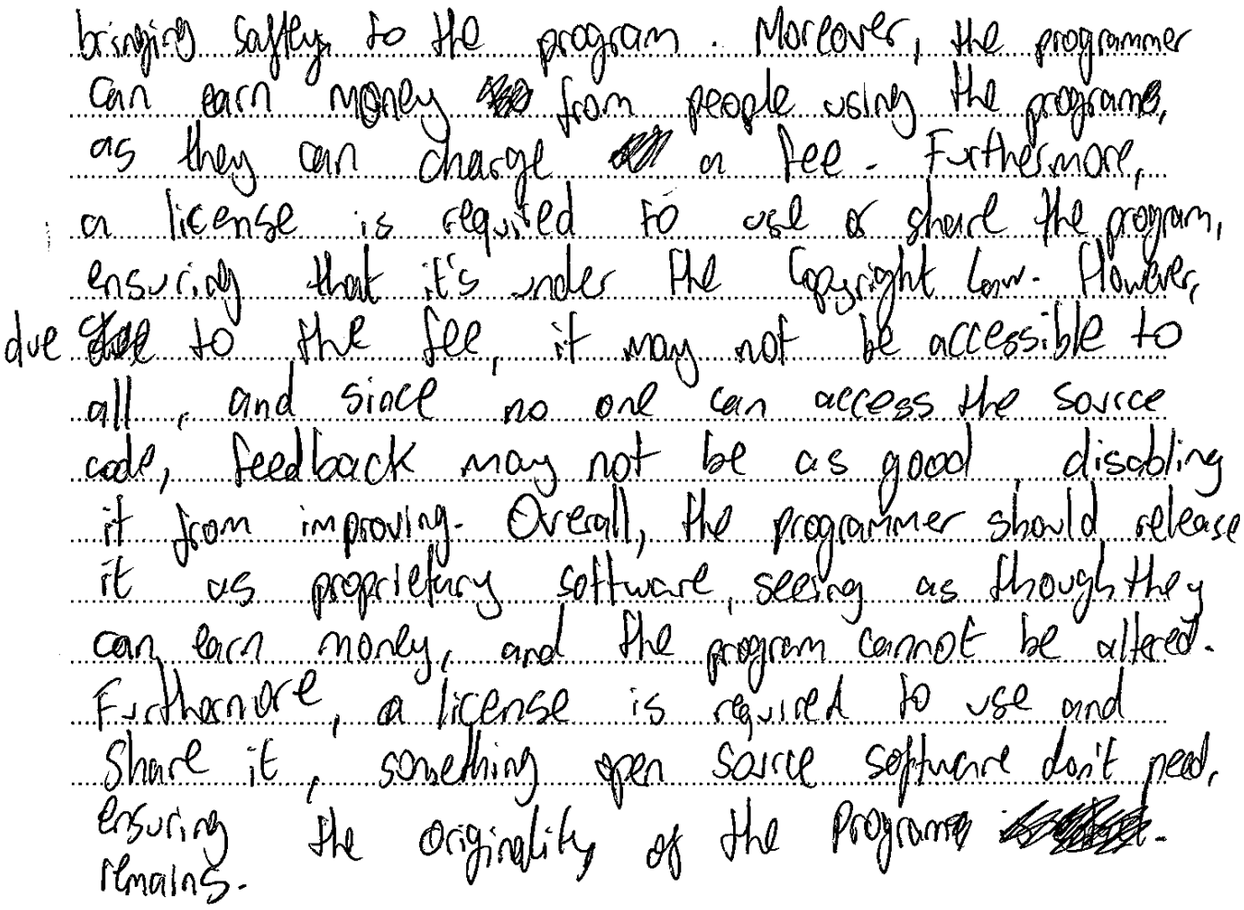
Exemplar 1


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 & 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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Question 5 (a) (i)

5 A musician uses a computer to make and record music.

(a)
(i) Tick (✓) **one** box to identify the correct description of sound sampling.

- ☐ The frequency of the wave is measured a set number of times each second.
- ☐ The amplitude of the wave is measured at set intervals.
- ☐ The digital sound wave is measured a set number of times each second.
- ☐ The analogue sound wave's resolution is measured at set intervals.

[1]

Some candidates were able to correctly identify that it was the amplitude that is measured at set intervals. A common error was that the frequency of the wave is measured, the frequency is a technical sound term that relates to the pitch of the wave, or the number of times the wave changes.

Question 5 (a) (ii)

(ii) Explain how changing the bit depth will affect the sound file.

.....

.....

.....

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

This question was answered well by many candidates who were most commonly able to identify that the file size would change. Many candidates gave this through an example that when the bit depth increases the file size also increases.

Candidates also often identified that the quality of the sound would increase, or that the sound would become more accurate when compared to the sound being recorded.

Some candidates incorrectly identified that the bit depth would result in more samples being taken per second.

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Question 5 (b) (i)

(b) The musician has run out of storage space on their secondary storage device and needs to buy a replacement.

(i) Identify whether the musician should buy a magnetic secondary storage device or a solid state secondary storage device for their computer.

Justify your choice.

Type .....

Justification .....

.....

.....

.....

.....

[4]

This question required candidates to identify which of the two choices they would make and to justify their choice. Either choice was appropriate and candidates were given marks for explaining why they had made the choice they did.

There was no common choice with both often being selected.

Choices were often suitably justified. Common points included the amount of data that could be stored with some candidates also linking this to the need for sound files to have a high capacity. Candidates often identified that solid state has a faster access speed than magnetic, although some responses just stated that it was faster without identifying what it was faster at.

When justifying solid state candidates often identified the robustness of the device and linked this to the musician possibly needing to move the device.

Magnetic justifications often identified that although they had slower access speed than solid state this would still be sufficient. They also identified that it does have moving parts, but if the device is not being moved then the durability of solid state is also not required.

Misconception

A misconception is that solid state devices have more longevity than magnetic, that they have an unlimited life span and will outlast magnetic.

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Question 5 (b) (ii)

(ii) Identify **one other** type of secondary storage.

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

Some candidates found this question challenging and were not able to give a different type of secondary storage, often repeating magnetic or solid state from the question. Candidates quite often did not provide a response to this question.

Question 5 (b) (iii)

(iii) Tick (✓) **one** box to identify the smallest secondary storage capacity.

- ☐ 2.1 GB
- ☐ 300 MB
- ☐ 200 000 KB
- ☐ 0.0021 TB

[1]

Some candidates were able to correctly identify the smallest capacity of 200 000KB. 300MB was often inaccurately selected.

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Question 5 (b) (iv)

(iv) The musician's recordings have an average (mean) file size of 3 MB. The musician has 1000 recordings.

Calculate an estimate of the storage space in GB that the 1000 files will require, assuming they are each 3 MB in size. Show your working out.

Working space:

Answer: ..... GB **[2]**

Candidates were often able to gain a mark for partial working, for example by multiplying 3 and 1000 even if other parts of the working then performed incorrect calculations.

Question 6 (a)

6 A computer has a Central Processing Unit (CPU).

(a) Describe what happens during the fetch-execute cycle.

.....

.....

.....

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

Candidates often correctly identified that data is fetched from memory, or from RAM, and are then processed. Some candidates gave a more technical description including the role of the registers in this process. The stronger responses included clear references to data or instructions being processed. Some candidates inaccurately identified that information was processed, or that programs were fetched from memory.

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Question 6 (b)

(b) Complete the table by writing the name of **two** registers used in the fetch-execute cycle **and** the purpose of each register.

Register	Purpose

[4]

Candidates were often able to identify one or two registers that are used in the F-E cycle. Fewer candidates were able to give a purpose in the F-E cycle.

Some candidates identified that the registers were involved in the fetching or transmission of data, for example that the MAR transmits the address to RAM..

Misconception

A common misconception is that the program counter keeps track of how many programs have run or counts the instructions that are being processed.

Question 6 (c)

(c) Give **three** characteristics of a CPU that can affect its performance.

1 .....

2 .....

3 .....

[3]

Candidates were often able to identify at least one characteristic of a CPU, most commonly the clock speed and number of cores. Some responses were not precise enough as to the characteristics, for example stating 'clock' or 'core' without reference to the speed of the clock, or the number of cores, which were too ambiguous.

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Question 7 (a)

7 A car has a 'Follow Me' system that uses a cruise control feature to allow the car to follow the car in front of it. It will keep the same speed and distance without the driver's intervention. The cruise control system is an example of an embedded system.

(a) Explain the reasons why the 'Follow Me' system is an example of an embedded system.

.....

.....

.....

.....

.....

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

This question required candidates to apply their understanding of embedded systems to a different system.

Candidates were often able to identify the key features of embedded systems that were relevant to this scenario. The most common points being that the system has a single purpose. Some candidates also identified that the system is built within a larger system, being the car.

Fewer candidates were able to provide a third point. Those that did most commonly identified the dedicated hardware or gave an example such as the sensors are only providing data for this system.

Question 7 (b) (i)

(b) The car's system has Read Only Memory (ROM) and Random Access Memory (RAM).

(i) State **two** items that will be stored in the ROM for the 'Follow Me' system.

1 .....

2 .....

[2]

Many candidates were able to identify that ROM stores the start-up instructions or gave an example of these instructions.

Some candidates were also able to identify that an embedded system runs firmware, or gave a description of the program for this system being stored in the ROM.

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Question 7 (b) (ii)

(ii) The RAM will store currently running data and instructions.

State **three** items of data that will be stored in the RAM for the 'Follow Me' system.

1 .....

2 .....

3 .....

[3]

Candidates were told that the system stores currently running data and instructions in RAM and required an application of that data to the given scenario.

The most common responses related to the speed of the car and the distance between the cars. Some candidates identified that the speed of the car in front was stored as well as the current speed of that car.

Some candidates identified other data that could be stored in the RAM, for example whether the driver has control, if the system is currently active as well as data that would be needed to identify which car is being followed.

Question 7 (b) (iii)

(iii) Explain why the 'Follow Me' system does not need virtual memory.

.....

.....

.....

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

Many candidates were able to identify that VM is used when a system is short of RAM, they were then able to apply this to the given system, i.e. that the current system will not run out of RAM. Some candidates expanded this by also identifying that very few data items would be stored in RAM.

Some of the stronger responses included an acknowledgement that the embedded system is unlikely to have secondary storage and therefore cannot create VM.

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