Chhetri Academy

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GCSE COMPUTER SCIENCE

1.2

OCR J277 | Specification point 1.2.2

Secondary storage

Untiered

Answers and examiner comments

8	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"

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.

Question			Answer / Indicative Content	Mark	Guidance
1	a		1 mark per bullet to max 2 • Hardware • Software • Allows for input, process and output	2	All of input, process and output required for third bullet. Do not accept examples of hardware/software.
1	b	i	Input: to allow instructions/data/commands/destination to be input/entered/given/example (e.g. entering a post code)	1	Do not accept "information".
1	b	ii	1 mark for input device, 1 for sensible use of device e.g. • Microphone… • …to let the user say their destination/voice recognition • Touch screen… • …let the user press options/enter data • Keyboard / braille keyboard… • …to let the user enter their destination • Camera… • …to let the user enter/select options by moving their eye/use an eye typer • Puff/suck switch… • …to allow the users to select options	2	Allow any reasonable **input** device, do not accept software e.g. voice recognition. Do not accept "sensor" without detailing what type of sensor. Accept "braille keyboard" but do not accept "braille" on its own. Accept buttons. Second mark is awarded for a sensible use of the device – for example, what is inputted (eg the destination) or how it is inputted (eg inputted using your voice). If input device is incorrect, do not award follow on mark for use.
1	c	i	1 mark for why, 1 for application • Long term/permanent/non-volatile/persistent storage • Store maps//user preferences//journey history//operating system//sat nav software	2	Second bullet point must be related to the sat nav, not just generic "programs" or "data".

1	**c**	**ii**	1 mark for identifying the reason why solid state was chosen, 1 for explanation e.g. • Is durable/robust//no moving parts • Less likely to be damaged//by example (eg dropped) • Faster <u>read/write speed</u> • Faster to boot//faster to load maps//more responsive • Small in size/light in weight • Reduces size of the sat nav// fit inside the sat nav • Lower power requirements • More suitable for running off batteries	**2**	Do not accept portability / reliability. Do not accept “faster” without clarification of what is faster.
1	**d**	**i**	1 mark per bullet to max 1 • <u>Fetch data/instructions</u> • <u>Decode data/instructions</u> • <u>Execute instructions</u> • Performs fetch-(decode)-execute cycle • Performs calculations/arithmetic/logical operations	**1**	Must include fetch / decode / execute as verb for first three bullet points. Must include reference to either data or instructions. Allow reference to tasks carried out by the Control Unit.
1	**d**	**ii**	1 mark per bullet to max 2 • Computers are made of logic gates/transistors/switches… • …which can only be two states / on or off / 1 or 0 /high or low	**2**	Second point dependent on first bullet point being awarded.

<table>
<tr><td>2</td><td>a</td><td>i</td><td>1 mark
e.g.
• Tags
• Hyperlinks
• Location/dimensions/name of images/videos/sound
• Structure / e.g. table
• Layout instructions
• Formatting e.g font/colour/style
• Metadata</td><td>1</td><td>Accept any valid item that could be in a HTML file e.g. a link to a CSS file

Accept other languages/scripting that could embedded into a HTML document, eg CSS/Javascript/etc.

Do not accept: image, video etc. The HTML file holds a link to the files, not the actual image or video itself.

Mark first answer only.</td></tr>
<tr><td>2</td><td>a</td><td>ii</td><td>1 mark per bullet to max 2
• All webpages are made using HTML
• All browsers read/understand HTML
• Allows for compatibility
• Allows devices to understand the same code/display the webpage correctly</td><td>2</td><td></td></tr>
<tr><td>2</td><td>b</td><td>i</td><td>1 mark for getting 1 correct
2 marks for getting both correct
<table><tr><td></td><td>Red</td><td>Green</td><td>Blue</td></tr><tr><td>Decimal</td><td>111</td><td>58</td><td>156</td></tr><tr><td>Hexadecimal</td><td>6F</td><td>3A</td><td>9C</td></tr></table></td><td>2</td><td></td></tr>
<tr><td>2</td><td>b</td><td>ii</td><td>1 mark per bullet to max 1
• Easier to remember/to enter/to read
• Faster to enter/read
• Fewer digits to remember/to enter/to read
• Less prone to error when entering/reading/communicating
• Quick to convert into binary</td><td>1</td><td>Do not accept “easier to understand”

“Less prone to error” requires further detail as shown.</td></tr>
</table>

2	**c**		1 mark per bullet to max 2 • Compression makes the file size smaller//takes up less space (on Shannon's computer) • File(s) upload more quickly / lower bandwidth required • File(s) take up less storage space on the web server • File(s) can be downloaded/streamed more quickly by the end user//website will load more quickly	**2**	
2	**d**		1 mark per bullet, to max 3 • URL/domain name is sent to the DNS • DNS has a list/database/table of URLs **and** matching IP addresses. • DNS looks up/translates/resolves/searches/finds the IP address • DNS sends back IP address (to web browser) • If not found, refers to higher/other DNS/returns error • DNS updates from other DNS • Browser uses IP address to retrieve webpage / connect to web server.	**3**	Do not accept "each URL has an associated IP address" on its own.

3	a		1 mark for each pseudocode statement
			
			`Total = Total + NumberArray(`**`Count`**`)`
			
			`Mean =` **`Total/Quantity`**
			`or`
			`Mean =` **`Total/Count`**
			`or`
			`Mean =` **`Total/10`**
				2	Ignore capitalisation.
					
					Accept any correct symbol or structured English meaning division for mean calculation.
					
					Accept mean calculations that refer to 11 numbers:
					e.g.
					• Total/11
					• Total/(Count+1)
					• Total/(Quantity+1)

3	b		1 mark per bullet, max 2 for definition, 1 for example Definition: • A location in memory • A value/data that cannot be changed (whilst the program is running) Example: • `Quantity`	3	0 marks for "stays the same" / “does not change”. Must have the idea that it cannot / is impossible to change. Correct answer only (“Quantity”) for the example. Do not accept other surrounding code (eg “Const Quantity = 10” is incorrect). Do not accept incorrect spellings. Ignore capitalisation. Do not accept “a constant is a variable that…”
3	c		1 mark for data type, 1 for justification Data type: Real/Float/Single/Double/Decimal Justification: can be decimal/fractional/not a whole number	2	If candidate uses “decimal” as data type, do not accept “can be decimal” for the justification. Do not award justification if data type is incorrect.
3	d	i	1 mark per bullet, to max 2 • A construct • Code is executed/run repeatedly//is looped • Until a condition is met/while a condition is true/a set number of times	2	Do not accept only an example (eg “for loop”).
3	d	ii	• While/do while • Repeat/ Repeat until/do until/ Until	2	Do not accept “do loop”.

3	**e**		1 mark for sensible borderline data, 1 mark for sensible invalid data. • Borderline – 0, 100 • Invalid – number less than 0 (eg -1, -12) / number more than 100 (eg 101, 206) / non-numeric data (eg “test”, “#!*%”)	**2**	
4	**a**		1 mark per bullet to max 2 • The data is stored permanently / is unchanging / remains when the DBMS or application is closed / non-volatile / on secondary storage • The data has a structure / stored in tables / fields / records	**2**	Accept rows / columns as alternative to records / fields for second bullet point.
4	**b**	**i**	1 mark for data type, 1 for justification Data type: Text/String Reason: leading 0s/will not be treated as a number	**2**	Accept Alphanumeric/Varchar/Char as alternatives for Data type. Do not award reason if data type is incorrect.
4	**b**	**ii**	4	**1**	Correct answer only.
4	**b**	**iii**	1 mark for Field name, 1 for reason Field: RequestID Reason: it will be unique/each request will have a unique number/it will not be repeated/other fields can be repeated	**2**	Do not award reason if field is incorrect. Do not penalise incorrect spelling or capitalisation.
4	**c**	**i**	Max 1 mark per validation rule. Both rules must be different, e.g. cannot both be presence TeacherID e.g. • Presence check//must be entered • Format check//must be letters then numbers • Existence check//must already exist in the database • Lookup//must be selected from a list of valid teachers • Type/character check//must be string • Length check//must be (minimum of) 3 characters long	**2**	Accept any reasonable validation rule for a field Accept name of a rule, or example Mark first answer only if candidates have provided multiple validation techniques for each.

			Date e.g. • Range check//must be within certain dates • Presence check//must be entered • Format/character check//must be DD/MM/YYYY • Type check//must be a valid date • Length check//must be 8/10 characters • Lookup/existence check//must be a valid date (eg from calendar)		
4	**c**	**ii**	3 marks for each feature, 1 for identifying, 1 for description, 1 for example use e.g • Query • Use to select specific information // find records that match a criteria // search for records // extract data • e.g. Find all requests made on a specific date • Form • User friendly way to enter data // uses drop down boxes etc. • e.g. form to enter a new request • Report • User friendly/formatted copy of results // can be used as a hard copy // method of outputting data • e.g. report of all requests made by one teacher for printing • Security • Stop unauthorised access or modification • e.g. usernames and passwords	**6**	The feature identified must be a feature of a DBMS and not a database. Allow any sensible example that relates to this database. If feature is incorrect, do not award marks for description or example. If feature is poorly identified (eg search instead of query), give credit for matching description / example but not for identification. Mark feature/description/example together. Allow table creation / editor / modules / integrity checks / access control / concurrent access / creating links between tables. Do not accept validation (in the question) Do not accept tables / fields/ key fields (all features of a database, not a DBMS).

5*			Points may include: Ethical issues: • Safer driving as no room for human error • Can machines make snap judgements, taking into account all factors – can impact safety • Cars can react to the facts, i.e. avoid accidents • Can record where people go and when they go – how is this data going to be stored, or used? • Impact on pollution (negative and positives) • Impact on employment (taxis / delivery drivers) Legal issues: • Cars will not break traffic laws, e.g. run red lights • Issues with who is legally the driver • Is a drivers' licence needed? • Who is legally liable/responsible in an accident? • Insurance requirements • Data Protection issues with data generated • Possibility of "hacking" into cars • May need to change or adapt existing laws Many points can be considered from both an ethical and legal point of view. Candidates may refer to other valid scenarios of automated technology, not just driverless cars.	**6**	**High Level Response (5-6):** A detailed discussion of at least one ethical and one legal issue, with clear explanations that are linked to the scenario. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly. **Medium Level Response (3-4):** A description of an ethical and/or a legal issue with some explanation/justification that may be weak at times. Material may not be explicitly linked to the context. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct. **Low Level Response (1-2):** There is an attempt to describe either a legal issue or ethical issue. The points are poorly expressed or are not related to the context. There is limited, if any, use of technical terms. Errors in grammar, punctuation and spelling may be intrusive. 0 marks, response not worthy of credit

6	**a**		Max 2 per explanation, 1 for example e.g. • Share files between computers/employees // by example • Centralised data storage // by example • Allows for collaborative working // by example • More efficient working practices // by example • e.g. OCR Accounts use a shared drive to share work • Share devices / printers / routers // by example • Fewer peripherals / printers required// by example • Save money in purchasing equipment// by example • e.g. OCR Accounts only needs 1 printer, rather than 1 per employee • Improved communication // by example • Can use e-mail/other appropriate means // by example • e.g. OCR Accounts can e-mail documents/work • Central management of security // by example • Anti-virus/firewall/security is configured for all computers // by example • e.g. each computer at OCR Accounts does not need its own security • Centralised backups // by example • Can backup all computers automatically // by example • e.g. OCR Accounts can backup data for all staff • • Centralised updates // by example • Can update all computers at the same time // by example • e.g. OCR Accounts can update software without having to visit everyworkstation.	**6**	Accept any other reasonable benefit for using a network in this scenario, except for monitoring. Mark question as a whole. 3rd mark is awarded for example linked to the scenario, so max 2 per benefit if no example given.

A451			Mark Scheme		June 2017
6	b	i	Modem/Router	1	

6	b	ii	max 2 marks per hardware device e.g. • NIC… • …to connect Ethernet cable to computer • Router… • …to receive and transmit data within the network/to send data around a network/to join networks together/to connect to the Internet • Bridge… • …connect networks together • Switch… • …to connect multiple devices together / directs traffic to its destination. • Hub… • …to connect multiple devices together. • Server… • …to store the data/manage the network/store backups • Wireless Access Point/WAP… • …to allow for wireless transmission of data • Cables… • …to connect devices together • Modem… • …to connect computers via telephone lines // to covert digital data to analogue / to convert analogue data to digital.	4	Accept any hardware device that can be used to create/set up/produce a network. Device must be different than answer given in 6bi Accept repeater / range extender / powerline adaptor etc.

6	c*		Points may include:
			• Acceptable use
			  ○ Define what employees can/cannot do on a network
			  ○ Restrict employees to only performing work tasks
			  ○ Stop illegal activities such as accessing inappropriate material, downloading software
			• Disaster recovery
			  ○ A plan in case something happens to the computers/network/data
			  ○ A plan to allow recovery to avoid downtime/restore the network/data
			• Failover
			  ○ Backup devices ready to automatically take over if a device fails
			  ○ Allows the company to continue working
			  ○ Avoids downtime
			• Backup
			  ○ A plan for when data is backed up
			  ○ How it is backed up
			  ○ Who is responsible for it
			  ○ Where it is backed up etc.
			• Archiving
			  ○ Removing old data that is no longer needed but kept in case needed
			  ○ Free up memory space in a computer
			  ○ Plan of when data will be archived, what will be archived etc.
			• Security
			  ○ Levels of access
			  ○ Usernames / passwords / authentication
			  ○ Encryption
				6	**High Level Response (5-6):**
					A detailed discussion of network policies, covering points from at least **two** different policies, with clear explanations of purpose that are linked to the scenario.
					There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly.
					
					Medium Level Response (3-4):
					A description of some network policies, covering points from at least **two** policies, with some explanation/justification that may be weak at times. Material may not be explicitly linked to the context. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct.
					
					Low Level Response (1-2):
					There is an attempt to describe at least **one** network policy. The points are poorly expressed or are not related to the context. There is limited, if any, use of technical terms. Errors in grammar, punctuation and spelling may be intrusive.
					
					0 marks, response not worthy of credit

7			1 mark per bullet:
			• Storing a number for the user to guess
			• Loops 10 times correctly
			• Inputs the user's guess
			• If correct, outputs congratulations **and** stops the loop / ends the game (any appropriate method of breaking out of loop)
			• If the guess is greater than stored number, outputs lower (or similar)
			• If the guess is lower than stored number, outputs higher (or similar)
			
			e.g. using while loop
			`num = 50 //(could be a random number)`
			`x = 0`
			`while x < 10`
			`  input guess`
			`  if guess == num then`
			`  output "Congratulations"`
			`  x = 10`
			`  elseif guess > num then`
			`  output "lower"`
			`  else`
			`  output "higher"`
			`  endif`
			`x = x + 1`
			`end while`
			
			e.g. example using for loop
			`num = 50 //(could be a random number)`
			`for x = 1 to 10`
			`  input guess`
			`  if guess == num then`
			`  output "Congratulations"`
			`  end //(could be break / exit, or x = 10)`
			`  elseif guess > num then`
			`  output "lower"`
			`  else`
				6	Allow pseudocode, flowchart, or structured English as long as it is not just repeating the instructions and where it meets the bullet points.
					
					If candidate uses FOR loop, accept 0 to 9 / 0 to 10 / 1 to 10 / 1 to 11 (or equivalent) as valid for 2nd bullet point.

			output "higher" endif next		

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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.

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.

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.

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.

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

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

<table>
<tr>
<td>1</td><td>b</td><td>i</td>
<td>1 mark for each row
<table>
<tr><th></th><th>RAM</th><th>ROM</th></tr>
<tr><td>Stores data</td><td>✓</td><td>✓</td></tr>
<tr><td>The memory is volatile</td><td>✓</td><td></td></tr>
<tr><td>Data will not be lost when the computer is turned off</td><td></td><td>✓</td></tr>
<tr><td>Data is read-only, cannot be changed.</td><td></td><td>✓</td></tr>
<tr><td>Stores currently running data and instructions</td><td>✓</td><td></td></tr>
</table>
</td>
<td>5
AO1 1a (5)</td>
<td></td>
</tr>
<tr>
<td>1</td><td>b</td><td>ii</td>
<td>1 mark

• RAM is volatile // Flash memory is non-volatile
• RAM is faster to access/store data than Flash memory // Flash memory is slower to access/store data than RAM
• RAM stores currently running programs/instructions/data/OS // Flash memory stores files and software
• RAM can be directly accessed by CPU // Flash data has to go to RAM before CPU</td>
<td>1
AO2 1a (1)</td>
<td>• Accept description of volatile/non-volatile

• Bod - RAM is primary // Flash is secondary</td>
</tr>
<tr>
<td>1</td><td>c</td><td>i</td>
<td>1 mark for any suitable example
e.g.
Solid state drive // SSD // flash drive
USB memory stick // USB drive
Memory card // SD card</td>
<td>1
AO1 1b (1)</td>
<td>• USB on its own is incorrect.

• Accept USB stick // memory stick

• Do not accept Hard drive, bod solid state hard drive</td>
</tr>
</table>

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

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

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

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

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

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

<table>
<tr><td></td><td></td><td></td><td>• Do not connect laptop to network // standalone computer
• So that there are no network threats

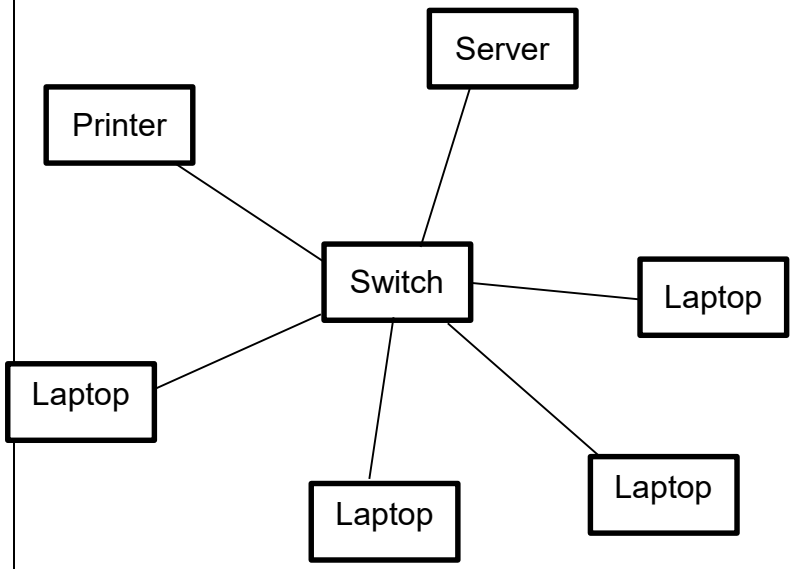
• Two-step verification // two-factor authentication
• For example sending code to mobile phone</td><td></td><td></td></tr>
<tr><td>3</td><td>b</td><td>i</td><td>1 mark per bullet to max 2
• Uses an algorithm to
• … jumble/scramble/mix up the data // turns it into cypher text // by example
• If it is accessed it cannot be understood // it is unintelligible
• Use of keys to encrypt/decrypt data</td><td>2
AO1 1a (1)
AO2 1b (1)</td><td>• 'Need the key to understand the data' can get both MP2 and 3

• Cannot read the data // data is unreadable is NBOD</td></tr>
<tr><td>3</td><td>b</td><td>ii</td><td>1 mark for each completed piece of code

<pre>message = input("Please enter your string")
newMessage = ""
messageLength = message.length
for count = 0 to messageLength - 1//
message.length - 1
  ASCIIValue = ASC(message.subString(count,1)
  ASCIIValue = ASCIIValue + 1
  if ASCIIValue > 90 then
    ASCIIValue = ASCIIValue - 26
  endif
  newMessage = newMessage & CHR(ASCIIValue)
next count</pre></td><td>5
AO3 2b (5)</td><td>• For <code>messageLength - 1</code> in loop accept <code>messageLength</code> or <code>message.length</code>

• Spelling must be exact, do not penalise case.</td></tr>
</table>

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

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

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

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

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

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

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

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

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

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Original question 6

The full source mark scheme begins on page 48. Use the original paper code, tier and question number shown above.

Question			Answer	Mark	Guidance
7	(a)	(i)	1 mark for • ROM is non-volatile, RAM is volatile // by description • Content of ROM cannot (usually) be changed, content of RAM can be changed	1	Read whole answer
7	(a)	(ii)	1 mark each to max 2 e.g. • Web browser/application that is **running** • (Parts of the) operating system currently **running** • Current video/film/tv program being watched • Data being downloaded/buffered • Button pressed by the user • Current volume • Current channel being watched • Source being watched (e.g. HDMI1)	2	Allow anything reasonable but must be clearly RAM e.g. not just stores the software/OS (this is secondary storage). Do not award brand names without exemplification.
7	(b)	(i)	1 mark for example e.g. the OS, web browser software, recorded show, user preferences 1 mark for • To store data once the computer is turned off / permanently // for non-volatile storage	2	Allow 2 marks by example, e.g. "To install software that will not be lost when the TV is turned off" gets 1 mark for software and 1 mark for not being lost when turned off. Do not award brand names without exemplification.

7	**(b)**	**(ii)**	1 mark for choice either magnetic or solid state 1 mark per bullet to max 3 for justification e.g. Magnetic: • Large storage capacity • … for storing software/videos/HD • Television unlikely to be moved • … therefore durability/portability not required • Cost to **purchase** is low • … so the TV will be cheaper to **manufacture**/**purchase** • Device will fit in a tv // device is small • Longevity // reliable Solid state: • Large storage capacity • … for storing software/videos/HD • Television may be moved • …therefore durable/robust/portable • Fast **data access** • … television will be more responsive • Cost to **purchase** is low • …so the TV is not too expensive to **manufacture**/**purchase** • Run quieter • Produce less heat • Use less energy • Compact // lightweight • …so tv can be made smaller / lighter	4	Do not award specific device, e.g. hard disk. Question asks for type. But then FT for justification to max 3. If device and type given award, e.g. solid state drive, SSD, magnetic hard disk drive. Mark first secondary storage type given. No secondary storage type, read justification for a type. Do not award this but mark justification (Max 3). Justification must match choice. If type is inappropriate e.g. optical, do not award.

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Original question 5

The full source mark scheme begins on page 63. Use the original paper code, tier and question number shown above.

Original question 5

The full source mark scheme begins on page 87. Use the original paper code, tier and question number shown above.

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OCR
Oxford Cambridge and RSA

GCSE (9–1)

Computer Science

J276/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

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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PMT

J276/01 Mark Scheme November 2021

Annotations

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

PMT

J276/01 Mark Scheme 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'.

PMT

J276/01 Mark Scheme November 2021

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

PMT

J276/01 Mark Scheme November 2021

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.

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			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

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.

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

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<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**

Question			Answer	Mark	Guidance
3	a		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**.	5	Award the same term used multiple times if used correctly
3	b	i	1 mark: • **Data** about the data/image/file	1	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.
3	b	ii	1 mark each: • First row: red red purple • Remainder correct and in correct order red / red / purple blue / green / blue purple / purple / purple red / green / blue	2	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.
3	b	iii	16	1	Accept any calculation that equates to 16 i.e. 2^4

PMT

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

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

PMT

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

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

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.

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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:

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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

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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.

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GCSE

Computer Science

J277/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2024

Oxford Cambridge and RSA Examinations

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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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MARKING INSTRUCTIONS

PREPARATION FOR MARKING
RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor 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 RM Assessor and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

   YOU MUST MARK 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 RM Assessor 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 RM Assessor 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
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

- there is nothing of relevance to the question written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is related to the question and 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.

8. The RM Assessor **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 RM Assessor 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 4 – 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. A single cross can be used when there is nothing of credit and 0 marks (instead of NR) is being awarded.
- 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 each
<table><tr><th>8-bit Binary</th><th>Denary</th></tr><tr><td>11110000</td><td>240</td></tr><tr><td>01101001</td><td>105</td></tr><tr><td>00011110</td><td>30</td></tr></table></td><td>3</td><td>Binary must be 8-bits</td></tr>
<tr><td>1</td><td>b</td><td></td><td>1 mark each
<table><tr><th>Statement</th><th>Answer</th></tr><tr><td>The smallest denary number that can be represented by a 4-bit binary number.</td><td>0</td></tr><tr><td>The largest denary number that can be represent by a 6-bit binary number.</td><td>63</td></tr><tr><td>The maximum number of different colours that can be represented with a colour depth of 7-bits</td><td>128</td></tr><tr><td>The minimum number of bits needed to represent 150 different characters in a character set.</td><td>8</td></tr></table></td><td>4</td><td>Accept calculations that equate to the same answer.

Accept any number of 0s for the first answer.</td></tr>
<tr><td>1</td><td>c</td><td></td><td>11110000</td><td>1</td><td>Ignore leading 0s</td></tr>
</table>

1	**d**		1 mark for an example 2-digit hex number **correctly** converted into denary. 1 mark each to max 2 for describing/showing each stage. Either: Multiplying: • **Multiply** the **left/first** digit by **16** • **Add** value of **second** digit (without additional calculation) Or: Converting: • Convert each digit into **4-bit binary** • Combine and convert the **8-bit binary** to denary	3	No marks for converting denary to hex. If the example has an inaccurate result, for example they have converted A to 11. They can still get the method marks. No requirement to show how letters are used.
1	**e**		1 mark for correct working (4 carries) 1 mark for answer 01111010 Working showing carries e.g. 01101011 00001111 01111010 1 1 1 1	2	Do not award working mark for conversion to denary and back. Carries must be on the correct values, but could be above, below etc.

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Question			Answer	Mark	Guidance
2	a	i	1 mark for each valid IP v4: • 4 groups of denary numbers between 0 and 255 separated by full stops (example v4: 123.16.46.72) v6 • 8 groups of hex numbers between 0 and FFFF separated by colons. Double colon can appear **once** and replaces any number of groups of consecutive 0000 (example v6: 0252:5985:89ab:cdde:a57f:89ad:efcd:00fe) (example v6: F513:8C:2A::999:0000 expanded would be F513:8C:2A:0000:0000:0000:999:0000)	2	V6 Each hex number can be between 1 and 4 digits
2	a	ii	1 mark each to max 2 • (usually presented in) hexadecimal / denary / binary • 6 groups of numbers // 12 (hex) numbers • … each group has paired/2-digit (hex) numbers / 8 bit binary number • 48 bits long • Separated by colons/hyphens • (The first half/part) contains the **manufacturer ID** // (first half/part) identifies the manufacturer • (The second half/part) contains the **serial number** // (second half/part) identifies the device	2	MP1 'numbers' is NE Allow both marks for a valid example. NB '6 pairs of numbers' gets MP2 and MP3. '4 pairs of numbers' gets MP3

2	**b**	**i**	1 mark each for benefit 1 for application to max 4 e.g. • Fast connection/speed // high bandwidth // consistent bandwidth • … e.g. reduce delays at check in // by example for airport • Secure // unlikely to have unauthorised access/hacked // data transmissions are likely to be safe • …e.g. so that data about passengers/staff/aeroplanes is not intercepted // by example for airport • Little interference // little chance of data loss // reliable • … e.g. flight status is received without delay // by example for airport • Long range transmission • … e.g. airport has a large floor area/terminals // by example for airport	4	Mark in pairs. Mark each benefit space to the candidates' benefit. An expansion/application for a benefit can be awarded in the other answer space. 1 benefit and 1 expansion for each answer space. Max 2 marks per answer space. **Max 3** marks if expansions have no direct application to the **airport** and its **computers** connecting using **wired** connections. If the second expansion is not applied, annotate with **^** NOT cost. The question is not a comparison to wireless, but accept answers worded in this way. Fast on its own is NE. 'faster to connect' is NE because this could

					be to set up the connection as opposed to the bandwidth.
2	**b**	**ii**	1 mark each to max 3 e.g. • Staff do not need to be in one-place // movement of staff // can work whilst moving to another part of the airport // can be accessed from any location (in range) • Staff can be more responsive to customers/requests • Allows a larger number of connections/devices // more scalable … • … without the disruption/cost of installing more cables • Some devices do not allow physical/wired connection // allow wider range of type of device (or by example such as vehicles/mobile devices/aeroplanes) • Easier to add/connect more devices • Do not need to find/use a physical connection/wire // can allow you to connect in a place where there isn't a cable/connection • For use as a backup if the wired connection fails	3	Do not award cost on its own. Do not award range on its own. Allow explanation of how a wireless network will benefit the passenger as well as the airport and staff. Allow in reverse if clear, for example wired restricts staff to one location.
2	**c**	**i**	1 mark each for drawing showing: • 5 computers, 2 printers and 1 switch **all clearly labelled** • All devices directly connected to the **switch** // all computers connected to **switch** and each printer to a switch/computer(s) • Only 8 devices **and** no additional connections other than to the switch (or central device, or printers to only one computer each)	3	Allow any type of computer e.g. PC, laptop. Do not accept client for computer. MP1 there must be at least 5 computers, at least 2 printers, at least 1 switch

PMT

2	**c**	**ii**	1 mark for benefit e.g. • Easier to add new nodes // easier to setup BOD • Central device can monitor/control **transmissions** • Faster data transmission • Fewer data collisions • One connection/computer breaks the network still works • Less cost of **cables** 1 mark for drawback e.g. • Switch fails the network fails // reliant on a central device (working) // single point of failure • Extra cost of **central device/switch**	2	Speed, cheaper etc. on its own is NE Server is irrelevant. Read whole benefit and award a valid benefit. Read whole drawback and award a valid drawback. Do not award contradictory statements.
2	**c**	**iii**	1 mark each to max 3 e.g. • Connects the devices together in the network // allows devices to communicate in the network • **Receives** data from (all) devices in the star topology • Record/register/store the address of devices connected to it … • …in a table • Uses MAC address of devices • Direct data **to destination** • …if address not recorded transmit to all devices	3	

J277/01 Mark Scheme June 2024

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

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

Peripheral: allow input and output devices by example.

File management, do not award folder management.

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

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

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

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

PMT

J277/01 Mark Scheme June 2024

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

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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."

J277/01			Mark Scheme		June 2024
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

J277/01 Mark Scheme June 2024

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).

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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.

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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	

PMT

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Question 7 (a) (i)

7 A smart television allows the user to search the Internet and watch videos online.

(a) The smart television has both RAM and ROM.

(i) State the difference between RAM and ROM.

.....

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

This question was answered well with many candidates correctly identifying that RAM is volatile and ROM is not-volatile.

When a difference is required candidates must make sure they are giving both sides of the difference. For example RAM is volatile is not enough on its own.

Some candidates gave the purpose of RAM and ROM. This is a difference in the use and not a fundamental difference between the two.

Question 7 (a) (ii)

(ii) Give **two** examples of data that the smart television could store in RAM.

1 .....

2 .....

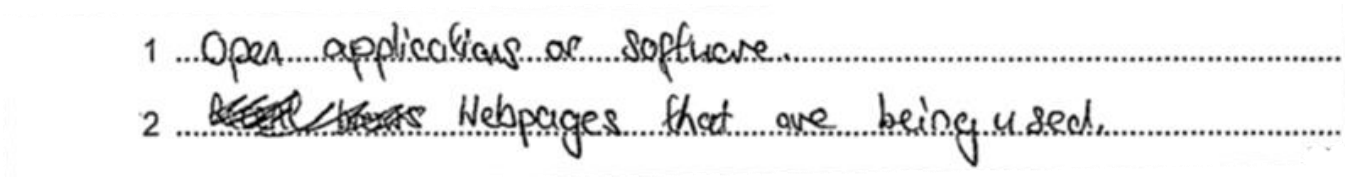
[2]

Some candidates found this question challenging.

Many responses were generic applications such as a streaming service, a tv programme, etc. A TV programme will not be stored in RAM, but the parts of it currently/about to be watched would be stored in RAM. Likewise, an application in its entirety will not be stored in RAM, but the parts that are being used will be.

The most commonly correct responses were the recording currently being watched, the data received from the remote control and the websites being accessed.

Exemplar 5



This candidate has identified two suitable examples of data and has given more than just identifying, e.g. applications. They have stated that it is the open applications, and webpages being used, which both demonstrate their understanding of when RAM is used.

Question 7 (b) (i)

(b) The smart television has secondary storage.

(i) State, using an example, why the smart television needs secondary storage.

.....

.....

.....

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

This question was answered well by many candidates.

Many candidates correctly identified an example, most commonly downloaded videos, the operating system, or applications. Fewer were able to expand this as to why, for example stating that it was needed for the computer to work.

Misconception

A common misunderstanding was that it is needed as a backup for when the television fails.

Question 7 (b) (ii)

(ii) Identify **one** appropriate type of secondary storage for the smart television. Justify your choice.

Secondary storage type .....

Justification .....

.....

.....

.....

.....

.....

[4]

Many candidates were able to correctly justify their choice of secondary storage.

A few candidates gave a type of storage, instead giving a specific device such as a hard drive.

There were some good examples of application in responses. For example, expanding the feature of high capacity to the need to download high-definition movies which can take up large amounts of storage. Another application commonly given was the need for a responsive television which was provided by the fast data access speeds.

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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.

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.

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.

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.

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.