Chhetri Academy

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GCSE COMPUTER SCIENCE

1.2

OCR J277 | Specification point 1.2.3

Units

Untiered

Answers and examiner comments

10	2016-2025	Untiered
question groups	available papers	tier

Using this booklet

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

Name _____ **Date** _____

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

Question			Answer/Indicative content	Mark	Guidance
5	a		max 2 for explanation max 1 for example/use of Figure 2 or 3 • An image is made up of/consists of pixels • A pixel can be one colour • Each colour has a unique/corresponding binary number • Each pixel/square is given the binary number of its colour • The binary numbers are stored in order in the file • E.g. White = 000, Red = 010, Blue= 110, top line would be 000000010010010110110	3	Accept answers that are annotated on Figures 1 and 2, or that use these to explain the storage of the image, that meet each bullet The example must be more than describing what the diagram shows, e.g. 'the squares with W in are white' is not enough.
5	b		2 from • Fewer bits are needed per colour • which means fewer bits per pixel • Any example from diagram	2	"fewer bits" with no reason or application is 0
5	c		Max 1 for description, 1 for example • To store data/information about the image/data • E.g.Dimensions/height/width/No. of bits per pixel/Colours used/location/date/file type	2	0 marks for filename as example 'tells you something about the image' = TV 0 marks for definition referring to how the image is ‘displayed’

A451 **Mark Scheme** **June 2016**

Question			Answer/Indicative content	Mark	Guidance
5	d	i	• The amplitude/height of the wave is measured • At set/regular intervals//by reasonable example • And stored as a binary number • The samples form an approximated sound wave	3	NOT frequency/pitch NB For the second bullet, this must relate to set intervals/the same interval. A set number of times per second does not suggest the same intervals.
5	d	ii	• File size increases • So the sound is truer/better quality/more accurate compared to the original/analogue	2	

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.

<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>(i)</td><td>1 mark per bullet to max 2.

• Height/amplitude of waveform is sampled/measured
• Converted to / stored as binary/digital
• Sample / measurements taken at a regular interval / set interval / by sensible example (eg 44,000 times per second)</td><td>2
AO1 1b (2)</td><td>Do not accept frequency

Do not accept unrealistic sample rates (e.g. once per second).</td></tr>
<tr><td>1</td><td>(a)</td><td>(ii)</td><td>1 mark per bullet to max 1.

• number of samples taken per second / per time period
• How <u>often/regularly</u> a sample is taken</td><td>1
AO1 1a (1)</td><td>Accept reference to Hertz (Hz) as time period.</td></tr>
<tr><td>1</td><td>(a)</td><td>(iii)</td><td>1 mark per tick to max 2.
<table><tr><th></th><th>Tick (✓) two boxes</th></tr><tr><td>The file size of the digital recording will be smaller</td><td></td></tr><tr><td>The file size of the digital recording will be larger</td><td>✓</td></tr><tr><td>The quality of playback of the digital recording will be better.</td><td>✓</td></tr><tr><td>The quality of playback of the digital recording will be worse.</td><td></td></tr></table></td><td>2
AO1 1b (2)</td><td>If 3 ticks given, max 1 mark
If 4 ticks given, 0 marks.</td></tr>
<tr><td>1</td><td>(b)</td><td>(i)</td><td>1 mark per bullet to max 3.

• Image made of / split up into pixels
• Each pixel given a binary code…
• …which represents the colour of that pixel
• Each colour is given a different/unique binary code.
• Metadata stored alongside the image</td><td>3
AO1 1b (3)</td><td>BP1 needs idea of picture made up of pixels, not just mention of the word “pixel”

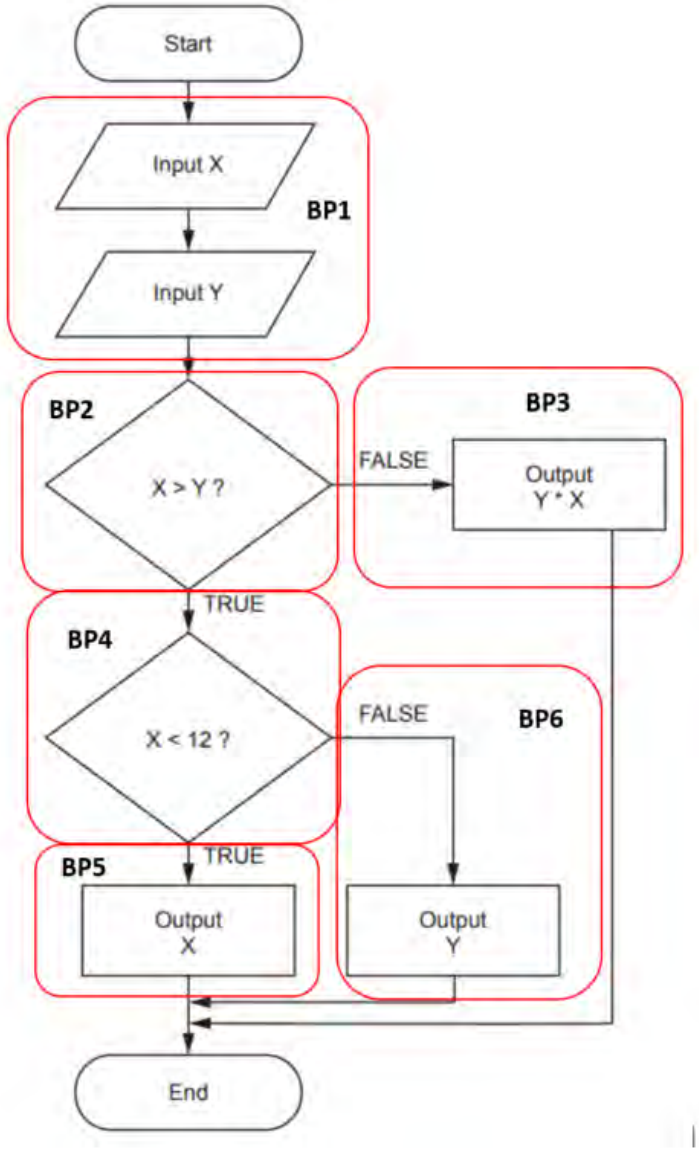
Not enough to say “each colour is given a binary code”, must have the idea of this being unique or different for each different colour.

Accept examples of metadata such as height/width, geolocation, etc. Do not accept file size/file name.</td></tr>
</table>

1	**(b)**	**(ii)**	1 mark per bullet to max 2. • Computers consist of transistors / switches / logic circuits / gates… • …which only have two values / on or off / 1 or 0 / open or closed	2 AO1 1b (2)	Only give BP2 if BP1 given. BP1 must refer to **hardware** that switches between two states. Do not accept processor for this.
1	**(b)**	**(iii)**	1 mark per bullet 2 marks max for advantages 2 marks max for disadvantages Advantages • **File** size is reduced / gets smaller // image contains less data • ..so quicker to **upload / download / load / transfer** • ...takes up less storage space // space on the web server • …less (mobile) data usage • …permanent reduction Disadvantages • Quality of image is reduced (compared to original) • …because data is lost / removed // by example (eg fewer colours / lower resolution) • …reduction is permanent / not reversible	4 AO2 1b (4)	Do not accept “size” to mean “file size” for advantage. “Data is permanently removed” gets 2 marks for a disadvantage

2	**(a)**		1 mark per bullet to max 4, 1 mark per row • 10 • 6 • 6 • 2	4 AO2 1b (4)	Correct Answer Only Do not accept “X”, “Y”, etc.

2	**(b)**		1 mark per bullet to max 6.
			
			• Inputs two value (as X and Y)
			• Compares if X is larger than Y…
			• …Outputs Y*X only when <u>False</u>
			• Compares if X is less than 12…
			• …Outputs X only when True <u>and X > Y</u>
			• …Outputs Y only when False <u>and X > Y</u>
				6
				AO3 2b (6)
					Question specifically asks for pseudocode.
					
					Outputs should only be given if they occur with the right condition(s).
					
					<u>Example algorithm</u>
					
					`input x`
					`input y`
					`if x > y then`
					`  if  x < 12 then`
					`  print x`
					`  else`
					`  print y`
					`  end if`
					`else`
					`  print y*x`
					`end if`
					
					Variables do not have to be called x and y.
					
					Accept equivalent comparisons (e.g. `if X <= Y`)
					
					Allow FT for outputs from incorrect comparisons where a sensible attempt has been made.

			Please note how mark bullet points match up to the flowchart given in the question. BP1 is for taking both inputs BP2 and 4 are for correct comparisons of variables. This may be done in alternative ways (e.g. X<=Y, X>=12, etc) BP3, 5 and 6 are for the correct outputs in the right place. If the answer logically works to produce the correct output, it should be marked as correct.		

2	**(c)**		1 mark per bullet to max 4, 2 mark max per method • Compiler • …translates code **in one go** / all at once • …produces an executable file // does not need to be compiled again • Interpreter • …translates code line by line. • …will be interpreted / translated every time it is run.	4 AO1 1b (4)	Mark first method only in each section
3	**(a)**	**(i)**	1 mark per bullet to max 1 • An error that results in **incorrect output / unexpected result** • Contains an error but **still runs / doesn't crash**	1 AO1 1b (1)	Do not accept examples of logic errors.

3	**(a)**	**(ii)**	`if num MOD 2 == 0 then`
			
			`if num MOD 2 = 0 then`
				1
				AO3 2b (1)
					Important point is that >= is changed to == or =.
					Accept alternatives that produce the same result (e.g. <=0, <1, !=1, etc.)
					
					Ignore any casting (e.g. using int() to convert to a number)
					
					Accept other minor changes to the line as long it logically works.
					
					Accept versions of MOD from high level languages (e.g. Python : `if num % 2 == 0`)

3	**(b)**	**(i)**	1 mark per bullet to max 1 • An error in the grammar of the program // error that breaks the rules of the programming language • Contains an error but will not run / translate / execute	1 AO1 1b (2)	**Do not** accept examples of syntax error (e.g. misspelling).
3	**(b)**	**(ii)**	`print("odd")`	1 AO2 1b (1)	Must include quotes (single or double). Do not penalise spelling mistakes in message. Accept sensible alternatives to "odd" Accept alternatives for print / output as long as spelling is accurate
4	**(a)**	**(i)**	1 mark per bullet to max 2 • Removing / hiding / obscuring **unnecessary** detail • Focusing on the important detail • Simplifies **the problem** // reduces complexity // Easy to solve / understand	2 AO1 1a (1) AO1 1b (1)	Accept answers relating to using fewer computational resources Must be the programmer making the decision.
4	**(a)**	**(ii)**	1 mark per bullet to max 1 • Suitable example of what can be focused on (e.g. player name, match results, goals scored) • Suitable example of what to remove/hide (anything relevant that is not results/goals scored) • Suitable example of a simplification made	1 AO2 1a (1)	Mark first answer only Allow any suitable example of abstraction as long it is relevant to the system. Allow either first name or surname to be removed as an example, but do not allow both to be removed.

4	**(b)**		1 mark per bullet, mark in pairs. Max 2 per point. e.g. • Input sanitisation • …cleaning up input data / removing unwanted data • …by example (e.g. removing special characters / preventing SQL injection) • Validation • …checking whether input data should be allowed / is sensible / follows criteria • …by example (e.g. goals cannot be less than 0) • Verification • … checking whether data has been entered correctly • …by example (e.g. double entry / visual check) • Authentication • …ensuring only allowed / authorised users can gain access • …by example (e.g. usernames /passwords) • Maintainable code • …to allow other programmers to understand the code • …by example(e.g. comments, indentation, meaningful variable names)	4 AO2 1a (2) AO2 1b (2)	Mark first answer only in each section For validation, allow one example of a type of validation (e.g. type check, range check) e.g. question so allow other sensible examples such as audit logging, encryption of data Do not allow “data is correct” as expansion for validation – validation checks that data is sensible or follows rules, NOT that it is correct. Planning for contingencies and anticipating misuse are not examples by themselves, but discussion of these may fit under other points – e.g. input sanitisation, validation.

4	**(c)**		1 mark per bullet to max 3 • `count` • `= nogoalscount + 1` • `nogoalscount`	3 AO3 2b (3)	Correct answer only. Accept alternatives to adding 1 to variable (e.g. `+= 1` / `++`) Penalise spelling once only, FT for further mistakes. Do not penalise case. Accept sensible messages printed out alongside `nogoalscount`
5	**(a)**		1 mark per bullet to max 2 • 163 • **Correct** working shown.	2 AO1 1b (2)	Award working mark independently of final answer but working must be correct (e.g. (16 x 10) + 3)
5	**(b)**		1 mark per bullet to max 2 • 91 • **Correct** working shown.	2 AO1 1b (2)	Award working mark independently of final answer but must be correct (e.g. 1+2+8+16+64 // correct binary headings with correct binary underneath)
5	**(c)**		• 9	1 AO1 1b (1)	Correct answer only Do not accept 3^2 or 3 x 3
5	**(d)**		1 mark per nibble to max 2 • 1101 1101	2 AO1 1b (2)	Mark from right to left.

Original question 5

The full source mark scheme begins on page 29. Use the original paper code, tier and question number shown above.

<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>
<table>
<tr><th></th><th>ASCII</th><th>Extended ASCII</th><th>Unicode</th></tr>
<tr><td>Can represent thousands of characters, including Russian and Chinese symbols.</td><td></td><td></td><td>✓</td></tr>
<tr><td>Can represent European characters such as ç or â.</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Uses different character codes for upper case and lower-case letters.</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td><td>3</td><td>1 mark per row</td></tr>
<tr><td></td><td>(b)</td><td></td><td>• 1000101 (E)
• 1001000 (H)</td><td>2</td><td>Ignore leading zeros</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>• The height / amplitude…
• …as a numerical value
• …of the wave(form)
•</td><td>2</td><td>DO NOT accept frequency

Do not accept "in binary" (given in question)</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>• 48,000 samples taken…
• …per second</td><td>2</td><td>BOD How often samples are taken // frequency of samples</td></tr>
</table>

		(iii)	e.g. • Reduce the sample rate (from 48KHz to a lower rate) • …so fewer samples are taken per second • Reduce the bit depth (from 24 bits to a lower bit depth) • …so less data is used for each sample • Use lossy compression… • … to remove data (that won't be noticed) • Use lossless compression… • …to identify patterns in the data • …store this more efficiently • Reduce the length of the sound file … • … by example (from 30 seconds to a lower length) // less data to store	4	Any 4 points for 1 mark each Allow "compression" by itself for 1 mark if no other compression mark awarded. Allow suitable expansion of this for 1 mark. Do not accept "data is not lost" as expansion for lossless or "data is lost" as expansion for lossy.

<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 each row

<table>
<tr><th>File size</th><th>2 megabytes</th><th>2 petabytes</th><th>2 kilobytes</th><th>2 bytes</th><th>2 gigabytes</th></tr>
<tr><td>2000 bytes</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>2000 terabytes</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>16 bits</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>4 nibbles</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
</table></td><td>4</td><td></td></tr>
<tr><td>1</td><td>(b)</td><td></td><td>1 mark for working
e.g. dividing by 2, or writing the powers/values with the binary below, subtracting.

1 mark for answer
11011101</td><td>2</td><td>No FT for answer from working.

Award the working mark if the binary is back-to-front i.e.
1 2 4 8 16 32 64 128
1 0 1 1 1 0 1 1</td></tr>
<tr><td>1</td><td>(c)</td><td></td><td>1 mark for working
e.g. multiplying by 16 (2 * 16 + 15), or converting to binary first (0010 1111)

1 mark for answer
47</td><td>2</td><td>No FT for answers from working.</td></tr>
<tr><td>1</td><td>(d)</td><td></td><td>1 mark for B0</td><td>1</td><td>Correct answer only</td></tr>
<tr><td>1</td><td>(e)</td><td></td><td>16</td><td>1</td><td>Correct answer only</td></tr>
<tr><td>1</td><td>(f)</td><td></td><td>00010001</td><td>1</td><td></td></tr>
</table>

Original question 6

The full source mark scheme begins on page 44. Use the original paper code, tier and question number shown above.

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

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

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

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

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

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.

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.

Original question 5

The full source mark scheme begins on page 64. Use the original paper code, tier and question number shown above.

Question			Answer	Mark	Guidance
1	(a)		1 mark for each completed term to max 6 An **analogue** sound wave needs to be converted into a digital sound wave. Sound **sampling** is when the amplitude of the sound wave is measured at set intervals. The **sample rate** is the number of times a second the sound wave is measured. This is given in Hertz. Each amplitude is given a **unique** binary number. The number of bits allocated to each sample is the **bit depth**. The **higher** the number of bits, the wider the number of amplitudes can be measured.	6	
1	(b)	(i)	1 mark from • The **smallest unit/part** of an image • A (single) square/dot/diode which has **one/single colour**	1	Accept screen in place of image. BOD block/particle etc. in place of square.
1	(b)	(ii)	1 mark for one stage of working: • 800 * 500 (= 400 000) • 400 000 * 10 = 4 000 000 • 4 000 000 * 8 (= 32 000 000 bits) • 32 000 000 / 8 = 4 000 000 • 4 000 000 / 1000 = 4 000 1 mark for answer 4000 kilobytes	2	For MP1 accept 8 * 5 BOD. Accept any method of doing calculations e.g. statements, grids, calculations. Accept division by 1024 instead of 1000. Final answer will be 3906.25 kilobytes. If no answer in the final answer space, look for answer clearly identified in working.
1	(b)	(iii)	8	1	Allow calculation that equates to 8

1	**(c)**		No mark for choice 1 mark per bullet to max 4 for matching justification Solid-state choice e.g. • Durable/robust // Less likely to be damaged/break • … no moving parts // because it does not get scratched like a disk • Larger **capacity** (than optical) // store more **data** • … needed because the **files** could be very large // there could be many **files** to transfer // store large number of **files** • Portable • … small in (physical) size // lightweight • **Fast** to **read/write/access** data • More compatible • … no additional device/drive is needed Optical choice e.g. • Large (enough) **capacity** // store sufficient **data** // BOD larger capacity • … needed because the **files** could be very large // there could be many **files** to transfer // store large number of **files** • Portable • … small in (physical) size // lightweight • Cost per unit is less // Cost for the same amount of storage is less • The fast access/read/write speed is not required • … files are being copied not run direct from the storage	4	Accept type by example. No choice – check justification for clearly stated choice and then award justification. No clear choice then 0 marks. Allow justification marks for using one, or not using the other. SS – BOD faster to transfer the data for read/write/access SS – BOD more 'efficient' to read/write/access. SS – accept optical may only be able to be written to once. Do not accept longevity/reliability.

PMT

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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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

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J276/01 Mark Scheme November 2021

Subject Specific Marking Instructions

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

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

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

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

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

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

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

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Question			Answer	Mark	Guidance
1	a		1 mark for each completed space ROM stands for **read** only memory. This stores the **start-up** instructions for a computer and cannot be **changed**. RAM stands for **random** access memory. This stores the instructions and **data** that are currently being used. If the computer does not have enough RAM to run a process it can makes use of **virtual** memory. RAM and ROM are both examples of **primary** memory. Memory located close to the processor that allows faster access than from RAM is called **cache** memory.	8	**read** **start-up** **changed** **random** **data** **virtual** **primary** **cache**
1	b	(i)	• CPU performs the FDE cycle • Process **instructions**	1	
		(ii)	1 mark per bullet to max 2 • Single core means there is only **one processor** • 2.5Ghz means it can run 2.5 billion FDE cycles per second	2	MP1 BOD single processor Allow instructions for MP2
1	c		1 mark each • PC • MAR • MDR • Accumulator	2	Accept other correct registers (e.g. CIR, IR) Read first answer on each line
2	a		1 mark for name, max 2 for description. e.g. • user interface • allows the user to communicate with the hardware • e.g. GUI/command prompt • allows the user to input data • outputs data to the user • memory management / multitasking • moves data between RAM and VM • gets data from RAM • stores data to RAM	6	Read whole answer for each. Max 2 for description, 1 mark for name.

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

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

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

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

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

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

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

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

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

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

PMT

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GCSE

Computer Science

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J277/01 **Mark Scheme** **June 2022**

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

   Award Zero '0' if:

   - anything is written in the answer space 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 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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J277/01 **Mark Scheme** **June 2022**

11. **Annotations**

Annotation	Meaning
	Omission mark
	Benefit of doubt
	Cross
	Follow through
	Not answered question
	Benefit of doubt not given
	Repeat
	Tick
	Too vague
	Noted but credit not given, blank pages, pages with no annotation

PMT

J277/01 **Mark Scheme** **June 2022**

<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 each row

<table>
<tr><th>File size</th><th>2 megabytes</th><th>2 petabytes</th><th>2 kilobytes</th><th>2 bytes</th><th>2 gigabytes</th></tr>
<tr><td>2000 bytes</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>2000 terabytes</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>16 bits</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>4 nibbles</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
</table></td><td>4</td><td></td></tr>
<tr><td>1</td><td>(b)</td><td></td><td>1 mark for working
e.g. dividing by 2, or writing the powers/values with the binary below, subtracting.

1 mark for answer
11011101</td><td>2</td><td>No FT for answer from working.

Award the working mark if the binary is back-to-front i.e.
1 2 4 8 16 32 64 128
1 0 1 1 1 0 1 1</td></tr>
<tr><td>1</td><td>(c)</td><td></td><td>1 mark for working
e.g. multiplying by 16 (2 * 16 + 15), or converting to binary first (0010 1111)

1 mark for answer
47</td><td>2</td><td>No FT for answers from working.</td></tr>
<tr><td>1</td><td>(d)</td><td></td><td>1 mark for B0</td><td>1</td><td>Correct answer only</td></tr>
<tr><td>1</td><td>(e)</td><td></td><td>16</td><td>1</td><td>Correct answer only</td></tr>
<tr><td>1</td><td>(f)</td><td></td><td>00010001</td><td>1</td><td></td></tr>
</table>

J277/01 **Mark Scheme** **June 2022**

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td></td><td></td><td>1 mark for each term or definition

<table><tr><th>CPU component or register</th><th>Definition</th></tr><tr><td>Program Counter // PC</td><td>Stores the address of the next instruction to be fetched from memory. Increments in each fetch-execute cycle.</td></tr><tr><td>CU (Control Unit)</td><td>(Sends signals to) synchronise / control / coordinates the processor/hardware/F-E cycle/processes/flow of data
// decodes instructions (in CIR)
// runs F-E cycle</td></tr><tr><td>Memory Address Register // MAR</td><td>Stores the address of the data to be fetched from, or the address where the data is to be stored.</td></tr><tr><td>Arithmetic Logic Unit // ALU</td><td>Performs the mathematical and logical calculations.</td></tr></table></td><td>4</td><td>Read whole answer for CU and award correct point at any stage.

CU 'sends signals to components' is not enough, it isn't saying what the signal's purpose is</td></tr>
</table>

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J277/01 **Mark Scheme** **June 2022**

Question			Answer	Mark	Guidance

3	(a)	(i)	1 mark each to max 3
			• Slower transmission of data // less data can be transmitted **at the same time** // the transmission rate decreases // time to send/receive increases
			• (More devices mean) more data is being transmitted (at a time)
			• **Bandwidth** will be split between all the devices (sending data) // each device uses some of the bandwidth
			• …this means that there is less **bandwidth for each device**
			• Devices have to wait **longer** before they can transmit // **increased** latency
			• If the maximum bandwidth is used then devices cannot transmit
			• Central device/switch/router has to handle more requests and may run slower
			• **More** collisions (likely) // **higher** error rate …
			• …more data has to be retransmitted
			• Loss of **more** packets …
			• …more data has to be retransmitted
				3	The question is why.
					
					More devices do not decrease the bandwidth of the network. They decrease the amount allocated/available to each device.
					
					Do not accept higher contention ratio. This term means the number of users on a connection, and is therefore repeating the question.

3	(a)	(ii)	1 mark e.g. • Bandwidth • Interference // by example • Wired // wireless // transmission medium • Type/amount of data being transmitted • Central hardware performance // by example e.g. router/switch • Error rate • Distance between nodes • Topology // physical layout • Wireless repeaters	1	Do not award the number of users. Question is performance of network as a whole, not an individual device.

PMT

J277/01 **Mark Scheme** **June 2022**

3	**(b)**		1 mark for each completed term A website is hosted on a **web server**. The computers that access the websites are called **clients**. The user enters a **Uniform Resource Locator** into a web browser. The web browser sends a request to the **Domain Name Server** for the matching IP (Internet Protocol) address. If found the IP address is returned. A request is then sent to the IP address for the website. An IPv4 address is made of 4 groups of digits. Each group can be between **0** and **255**. The groups of digits are separated by a **full stop**	7	Words are given so must match, however accept domain name system for domain name server, URL, DNS. Accept 0 and 255 in either order Do not allow server for web server because file server is another option and it will be ambiguous.
3	**(c)**		1 mark each to max 2 • Ethernet is used by (mostly) all manufacturers // Ethernet is used in many devices • To allow **compatibility** with other devices • Ethernet has a high bandwidth • Ethernet has inbuilt security • Ethernet is a proven/reliable connection • Ethernet is low cost for **purchase/installation/maintenance** (compared to other wired connections)	2	Accept description of a standard, and/or benefits of Ethernet (i.e. why has this become a standard).
3	**(d)**		1 mark each to max 3 e.g. • Receive packets • Forward/sending/transmitting packets • Maintain a routing table // by description • Identify the most efficient path to the destination / correct IP / correct location • Assign IP addresses to nodes/devices • Converts packets from one protocol to another.	3	Question is tasks carried out by a router, not the use of a router in a network.

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3	**(e)**		1 mark each to max 2 e.g. • Data cannot be **understood** if intercepted // The data will be meaningless • So that only authorised users can access the **confidential** material // protect **confidential/personal/user/library** data • To follow legislation/DPA	2	Question is transmission not storage Candidates might answer in terms of why encryption is good, or why the current system is not good. If the candidate has not clearly said which they are talking about (e.g. the current system ….. or encryption means ….) then the reverse of each mark point can be given.
3	**(f)**		1 mark each e.g. Send email: **SMTP** // simple mail transfer protocol Access website securely: **HTTPS** // hypertext transfer protocol secure	2	Mark first answer in each line. If abbreviation is inaccurate, check if written out (and vice-versa).
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.* **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in	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:** Legal issues: • Copyright designs and patents act - can check for plagiarism automatically and highlight posts e.g. videos or images • Data protection act - needs to make sure rules are followed so that the AI algorithm does not breach e.g. security • Check that materials are all legal • User has agreed the terms when signing up so should expect it Ethical issues: • Users may not want everything they post monitoring • May incorrectly block users/posts

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			relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material 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		• Can limit plagiarism • Can make sure inappropriate/illegal posts are not published • Website will need to tell users what it is doing and they must agree with it • Record of monitoring reports may be stored and used for other means • Users may feel safer using the website because they know inappropriate material will not be published Privacy issues: • Users may feel like they are being watched all the time • Terms and conditions may sign away their rights to privacy when using the website • People may prefer a computer analysing their posts than people reading them

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

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

J277/01 **Mark Scheme** **June 2022**

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

J277/01 **Mark Scheme** **June 2022**

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

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

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

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

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

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

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

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J277/01 **Mark Scheme** **June 2022**

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.

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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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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

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>

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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.

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

J277/01			Mark Scheme		June 2024
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>

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

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	

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Question 1 (a)

1 Computers represent data in binary form.

(a) Tick (✓) **one** box in each row to identify the binary unit equivalent of each of the given file sizes.

File size	2 megabytes	2 petabytes	2 kilobytes	2 bytes	2 gigabytes
2000 bytes					
2000 terabytes					
16 bits					
4 nibbles					

[4]

Candidates needed to calculate each file size into a different binary unit to identify which is the equivalent. This question was often answered well by candidates who were able to accurately identify the equivalent binary units. Most commonly accurate were the 200 bytes into kilobytes and 16 bits into 2 bytes. Fewer candidates converted 2000 terabytes into 2 petabytes.

Question 1 (b)

(b) Convert the denary number 221 into 8 bit binary. Show your working.

.....

.....

.....

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

Candidates were required to convert 221 into binary and to include their working. Most candidates included. Candidates used a range of methods to calculate the 8 bit binary number.

A common method was to write the binary header numbers and then use subtraction from 221.

Some candidates put the binary header numbers the wrong way around, going from left to right, getting the binary number reversed.

Some candidates did not accurately double the binary header numbers each time, including additional numbers such as 24.

Question 1 (c)

(c) Convert the hexadecimal number 2F into denary. Show your working.

.....

.....

.....

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

Candidates needed to convert the hexadecimal number 2F into denary and to show their working. Candidates showed a range of methods, most commonly converting each digit into 4-bit binary and then adding the sum of the final binary number.

Some candidates did not accurately convert F to binary, for example giving 1101 instead of 1111 which then left the final conversion incorrect.

Question 1 (d)

(d) Convert the binary number 10110000 into hexadecimal.

.....

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

This required the conversion of a binary number into hexadecimal. Working was not required to be shown to gain the mark available.

A common error was giving the final hexadecimal number as B, with the 0 missing. As 0 is the right most digit this will alter the value produced. When converting numbers between bases some candidates might find it beneficial to use their final answer to do the reverse calculation as a check. For example, if a candidate got the answer B, they then convert B back into binary which gives them 1011. 1011 does not equate to 10110000.

Question 1 (e)

(e) Identify how many unique values can be represented by 4 bits.

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

There were a range of responses to this question, commonly 15, 8, 4 and 2 were given. Candidates who gave 15 often had calculations to identify the highest number that can be represented in 4 bits; missing the number 0 that can also be represented.

Question 1 (f)

(f) Perform a binary shift of 3 places right on the binary number 10001110.

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

This question was often answered well with many candidates correctly shifting the number. Some candidates attempted to include a binary point to show where the binary numbers moved to. This is not part of the specification and should not be included.

Question 6 (a) (i)

6 A student is creating a range of documents for a school project.

(a) The student records a podcast about computer science.

(i) Describe how an analogue sound wave is converted into digital form.

.....

.....

.....

.....

.....

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

This question required candidates to describe how an analogue sound wave is measured and converted into digital. Many candidates were able to identify that the sound wave is sampled, with some also identifying that it was the amplitude (or wave height) that is sampled.

Misconception

A common misunderstanding is that the wave frequency is used. The frequency in sound sampling is the number of samples taken each second or in sound waves is the number of times the wave has high and low amplitudes within a given time. It is not the number of changes in a second that is recording, it is the height of the wave.

Question 6 (a) (ii)

(ii) Tick (✓) **one or more** boxes on each row to identify the effect(s) that each change will have on the sound file.

Change	File size increases	File size decreases	Accuracy increases	Accuracy decreases
Duration changes from 10 minutes to 20 minutes				
Sample rate changes from 44 kilohertz to 8 kilohertz				
Bit depth changes from 8 bits to 16 bits				

[3]

Many candidates were able to correctly identify that the increase in duration increases the file size.

The additional two changes were also often given accurately, but some candidates only gave one tick on each row for these, for example correctly identifying the change in file size but not accuracy.

Question 6 (b) (i)

(b) The student writes a report about volcanoes.

(i) The computer stores text using the ASCII character set.

Part of the ASCII character set is shown:

Character	ASCII denary code
M	77
N	78
O	79
P	80
Q	81

Identify the character that will be represented by the ASCII denary code 84.

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

This question was answered by many candidates who correctly gave the capital letter T. Some candidates clearly gave a lowercase t which would have a different ASCII code and was therefore incorrect.

Question 6 (b) (ii)

(ii) Identify a second character set.

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

Unicode was the most commonly given second character set given.

Misconception

Some candidates gave an additional character, e.g. U and its associated ASCII code demonstrating a misunderstanding as to what a character set is.

Question 6 (c)

(c) The student takes a photograph of their science experiment. The image file includes metadata.

Identify **three** pieces of metadata that is often stored with an image.

1 .....

2 .....

3 .....

[3]

This question was answered well with many candidates identifying examples of metadata for an image.

There were a wide range of correct responses. The most common responses were the bit or colour depth, the resolution and the file size.

Some candidates focused on the device that took the image originally, for example the type of camera, the GPS location or the time and date it was taken.

Question 6 (d) (i)

(d) The student compresses all their documents before emailing them to their teacher.

(i) Give **two** benefits of compressing the data before it is emailed.

1 .....

.....

2 .....

.....

[2]

This question required candidates to consider the reasons why the data is compressed before emailing it.

Many candidates answered this well with most identifying the reduction in file size and that this allows the email to be received faster.

Some candidates were not precise enough in their response. For example, stating 'It is faster' without identifying what is faster, in the context of the question this would be the compression is faster and hence incorrect.

Some candidates gave the same point multiple times i.e. the transmission of the email, by stating that it could also be downloaded faster. It can be downloaded faster because the transmission from the email server to the computer is faster, and hence the same reason.

A second common response was that 'It takes up less space', space on its own is not enough because the candidate is not identifying what this 'space' is, for example it could be space on the screen. For this question candidates needed to identify that it was the storage or memory space.

Question 6 (d) (ii)

(ii) Explain why lossy compression may **not** be appropriate to compress all of the student's files.

.....

.....

.....

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

This question required application to the question to demonstrate candidate's understanding. The compression is used to compress all of the student's files in the question. This includes a sound file, text document and image.

Lossy is usually appropriate for images and sound, but is not appropriate for text documents. Some candidates were able to identify this appropriately but some candidates inaccurately stated that the letters would be blurry, or some of the letters or words would not be displayed.

Lossy compression would not change the display of the letters and would not select words to be removed, instead the file would be corrupted.

Question 3 (a)

3 Binary numbers can represent different forms of data.

(a) One form of data is characters.

Complete the description of how computers represent characters in binary using the given list of terms. Not all terms will be used.

2	4	8	9	16	32	256	
71	72	74	76	78	80	81	
all	different	identical	one	repeated	similar	some	unique

A character set stores ..... of the characters that the computer can represent. Each character is given a ..... binary code. Lower-case and upper-case letters in a character set are given ..... binary codes.

One example of a character set is ASCII. This character set uses ..... bits for each character. If the code value for the character 'F' is 70 then the code value for the character 'L' is ..... .

[5]

This question required candidates to use the given terms to complete the description of character sets.

Many responses accurately identified that a character set stores all the characters. Some candidates identified each character as being given an identical code or a repeated code. This is incorrect.

The code for L was often given accurately.

The number of bits for each character had a range of responses given, commonly 256 bits for each character. The specification for J277 states that in the exam ASCII will be described as having 8-bits to avoid confusion between ASCII and extended-ASCII, which are not differentiated in the specification.

Question 3 (b) (i)

(b) Binary numbers can also represent images.

The table shows the colours that are used in an image and the binary value for each colour.

Colour	Binary value
Red	0000
Green	0010
Blue	1000
Purple	0110

The metadata states that the image is 3 pixels wide by 4 pixels high.

The data in the file starts in the top left of the image and goes from left-to-right, top-to-bottom.

(i) State what is meant by **metadata** in an image file.

.....

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

This question required a definition of the term metadata and many responses correctly defined it as the data about the image, or the data about the file.

Some candidates used information, for example the information about the file, which was not precise enough - but they often carried on with an example that supported their statement and demonstrated their understanding.

Misconception

A common misconception was that metadata identifies the colour of each pixel in the image.

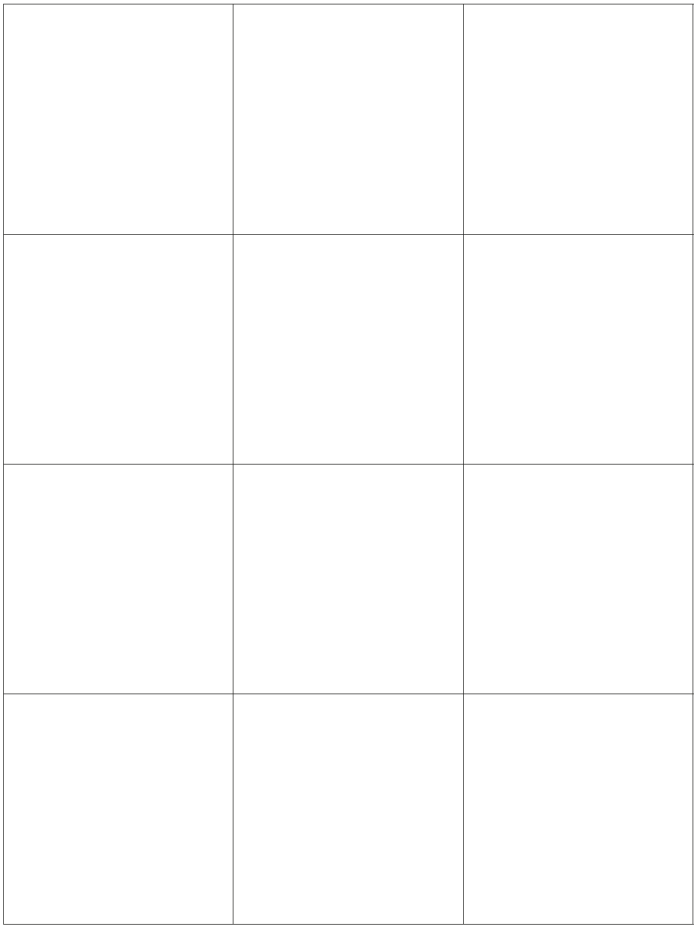
Question 3 (b) (ii)

(ii) The binary data stored for the image is given:

000000000110100000101000011001100110000000101000

A grid is given for the image. Each square is one pixel.

Write the name of the colour in each square that the pixel will show for this image.



[2]

This question required candidates to consider the binary number and the binary value for each colour, divide the binary number into groups of 4 bits and match them to the appropriate colour. This was completed accurately by many candidates who were able to match the codes and colours.

The instructions stated that the image starts in the top left, but some candidates started in the bottom right instead.

Some responses did not use the colours provided in the question and created their own colour scheme for the image, commonly just using black and white.

Question 3 (b) (iii)

(iii) A colour depth of 4 is used. This means 4 bits are used to store the colour for each pixel.

State the maximum number of different colours that can be represented in 4-bits.

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

Candidates were required to calculate the number of different colours that can be represented in 4-bits. This was done by working out how many binary numbers can be created using 4-bits. A common error was giving four colours, or in some cases only one or two colours.

Question 3 (b) (iv)

(iv) The colour depth is increased to 2 bytes.

State **two** effects that this change can have on the image.

1 .....

.....

2 .....

.....

[2]

This question was often answered well. Candidates commonly identified that the file size will increase with an increase in colour depth. Some responses also identified that this increase would allow the image to use more colours.

Misconception



A common misconception is that colour depth increases the resolution of the image. This would need to be an increase in the resolution (the number of pixels) as opposed to the number of bits per pixel.

Question 3 (c) (i)

(c) A student has a text document and an image file that need to be compressed separately.

The student needs to reduce the file size of both of these files as much as possible.

(i) Identify the most suitable type of compression for the **text** document. Justify your choice.

Type of compression .....

Justification .....

.....

.....

.....

[3]

Lossless compression was often correctly identified as the type of compression used for text.

Some candidates justified this in context either by explaining why lossless is required for text files, or by explaining why lossy was not appropriate.

Question 3 (c) (ii)

(ii) Identify the most suitable type of compression for the **image** file. Justify your choice.

Type of compression .....

Justification .....

.....

.....

.....

[3]

Many candidates correctly identified that lossy is the most appropriate. Lossless could be used but is not as appropriate in this scenario. Candidates who stated lossy compression were often able to describe how the loss of data would not be noticed, and some responses also identified that the file size could be decreased more.

Candidates that gave lossless were able to gain marks for the justification. However, often candidates could not justify it appropriately, for example by describing how it would be compressed instead of why this was appropriate.

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.

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Examiners' report

GCSE

COMPUTER SCIENCE

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

J277

For first teaching in 2020

J277/01 Summer 2025 series

Version 1

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Introduction

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

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

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

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

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Paper 1 series overview

Component 1 focuses on theoretical concepts of Computer Systems including:

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

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

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

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Question 1 (a)

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

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

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

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

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

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

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

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

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

[6]

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

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

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Question 1 (b) (i)

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

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

(i) Define the term pixel.

.....

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

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

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

Question 1 (b) (ii)

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

Show your working out.

.....

.....

.....

File size: ..... kilobytes

[2]

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

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Question 1 (b) (iii)

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

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

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

Question 1 (c)

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

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

Optical or solid-state .....

Justification .....

.....

.....

.....

.....

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

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

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

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

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

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Question 2 (a)

2 A computer has an operating system.

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

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

[5]

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

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

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

Question 2 (b) (i)

(b) A computer also has utility software.

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

.....

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

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

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

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Question 2 (b) (ii)

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

.....

.....

.....

.....

.....

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

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

Misconception

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

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Question 3*

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

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

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

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

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

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

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Exemplar 1

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

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

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

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

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

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

Question 4 (a)

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

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

1 .....

.....

2 .....

.....

[2]

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

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Misconception

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

Question 4 (b) (i)

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

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

.....

.....

.....

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

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

Misconception

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

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Question 4 (b) (ii)

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

Benefit .....

.....

.....

.....

Drawback .....

.....

.....

.....

[4]

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

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

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Question 4 (c) (i)

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

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

.....

.....

.....

.....

.....

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

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

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Question 4 (c) (ii)

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

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

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

[4]

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

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

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

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Exemplar 2

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

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

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

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Question 4 (d)

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

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

.....

.....

.....

.....

.....

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

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

Misconception

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

Question 4 (e) (i)

(e) Users will have access to the internet.

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

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

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

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Question 4 (e) (ii)

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

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

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

[4]

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

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

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Question 4 (e) (iii)

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

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

.....

.....

.....

.....

.....

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

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

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

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

Exemplar 3

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

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

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Question 4 (f)

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

Legislation .....

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

.....

.....

.....

.....

.....

.....

[4]

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

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

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

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Question 5 (a)

5

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

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

[1]

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

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Question 5 (b)

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

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

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

[4]

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

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Question 5 (c)

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

Show your working out.

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

[2]

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

Question 5 (d)

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

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

[1]

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

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Question 5 (e)

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

.....

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

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

Question 6 (a)

6 A computer uses the ASCII character set.

Part of the ASCII character set is shown here:

Character	Binary code
K	01001011
L	01001100
M	01001101
N	01001110

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

.....

.....

.....

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

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

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Question 6 (b)

(b) A new computer is being built.

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

Benefit .....

.....

Drawback .....

.....

[2]

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

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

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

Question 6 (c)

(c) The computer's CPU contains registers.

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

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

[2]

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

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

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