Chhetri Academy

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GCSE COMPUTER SCIENCE

1.2

OCR J277 | Specification point 1.2.5

Compression

Untiered

Answers and examiner comments

4	2015-2023	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.

<table>
<tr>
<td>2</td>
<td>a</td>
<td></td>
<td>
<table>
<tr><th>Content</th><th>Type of file</th></tr>
<tr><td>An image showing a map of the school.</td><td>JPG</td></tr>
<tr><td>A text document containing information to parents about the school rules.</td><td>PDF</td></tr>
<tr><td>A high resolution picture of all the staff and pupils.</td><td>JPG</td></tr>
<tr><td>A short video clip of some pupils saying why they like the school.</td><td>MPEG</td></tr>
</table>
1 mark per row
</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td>

When the file is compressed some detail/data/quality/resolution is lost...
... which is <u>not noticeable</u> in the video file/<u>video still viewable</u> with lower quality
… but would make the text file unreadable/lose meaning or comprehension

</td>
<td>3</td>
<td>The first bullet is for the idea that something is lost in the compression process.
The second bullet is for the idea that the video file is still usable with this loss.
The third bullet is for the idea that the text file is not usable.</td>
</tr>
</table>

<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”

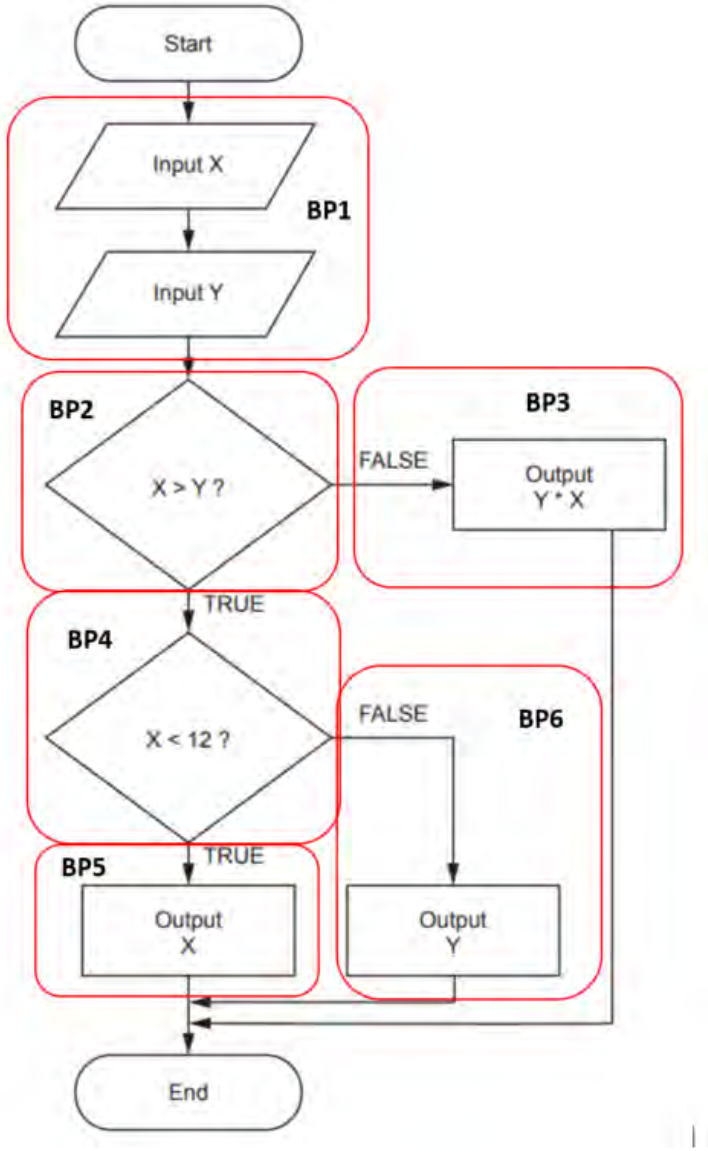
Not enough to say “each colour is given a binary code”, must have the idea of this being unique or different for each different colour.

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 6

The full source mark scheme begins on page 16. 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.

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GCSE

Computer Science

J277/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2022

Oxford Cambridge and RSA Examinations

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

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

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

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

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

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J277/01 **Mark Scheme** **June 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.

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

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

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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>

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td></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.

J277/01			Mark Scheme		June 2022
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

			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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J277/01			Mark Scheme		June 2022
			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		

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<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>

PMT

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>

PMT

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

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

PMT

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.

PMT

J277/01			Mark Scheme		June 2022
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.

PMT

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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.

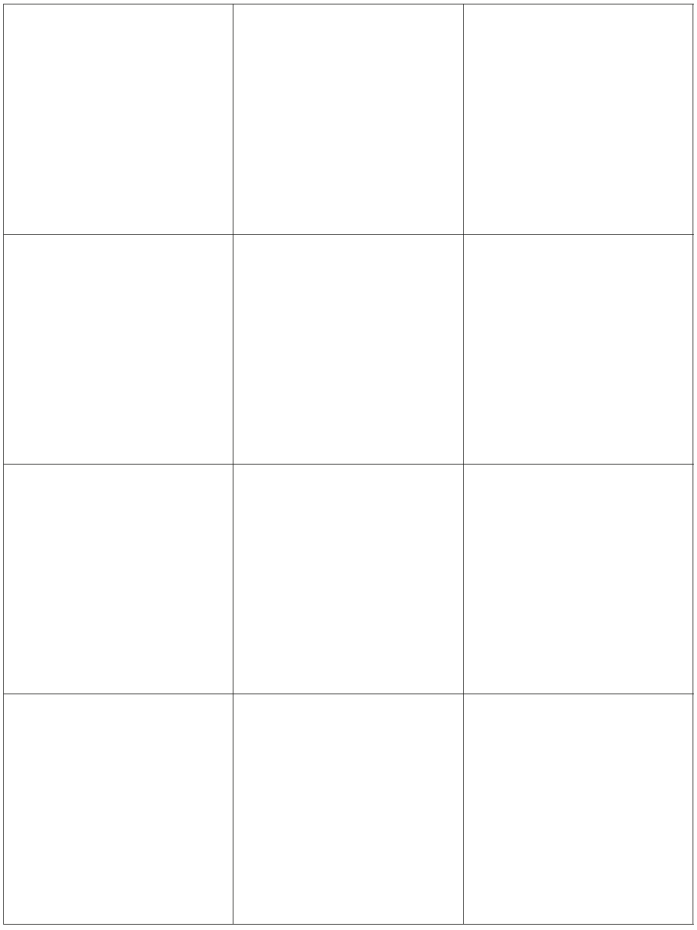
Question 3 (b) (ii)

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

00000000011010000010100001100110011000000010100 0

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.