Chhetri Academy

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GCSE COMPUTER SCIENCE

2.2

Edexcel 1CP2 | Specification point 2.2.2

How bitmap images are represented in binary (pixels, resolution, colour depth)

Untiered

Answers and examiner comments

6	2015-2025	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.

Original question 3

The full source mark scheme begins on page 17. Use the original paper code, tier and question number shown above.

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	One from: • 300 x 200 (1) • 200 x 300 (1) • 60000 (1)	Award mark if result is incorrect but expression is correct. E.g. 300 x 200 = 500	**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	Any three from: • All colours are combinations of RGB (1) • Each of R, G, B is 8 bits / 8 bits are allocated to the three primary colours, red, green, blue (1) • 3 colours x 8 bits each = 24 bits (1) • 2^{24} colours can be represented (1) • 24-bits are used to represent the colour of each pixel (1)		**3**

Question Number	Answer	Additional Guidance	Mark
1(b)	One mark for each pair of digits in the correct location. • 5F 9E A0		**3**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(c)</td><td>One mark for each correct cell.

<table>
<tr><th>HQ or MQ</th><th>NQ and (HQ or MQ)</th></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>1</td><td>1</td></tr>
</table></td><td>Award alternative representations of 0 and 1:
0 = OFF / FALSE / NO
1 = ON / TRUE / YES</td><td>6</td></tr>
</table>

1(a)	One mark for each pair of digits in the correct location. DE AF C4		**3**

Question Number	Answer	Additional Guidance	Mark
1(b)	**Binary:** One mark for 0001 0010. **Denary:** One mark for 18		**2**

Question Number	Answer	Additional Guidance	Mark
1(c)	**One** from: The number of pixels per cm^2/in^2 (1) The number of pixels on the vertical axis x the number of pixels on the horizontal axis (1) The amount of detail that can be seen (1)	Do not accept: 'Number of pixels' on its own	**1**

Question Number	Answer	Additional Guidance	Mark

1(d)	A comparison to include: Effect on colour depth (1) • More colours can be represented (with 24 bits) Effect on accuracy of representation (1) • So the image looks more realistic Effect on transmission speed/storage/memory (1) • But takes longer to transmit / creates larger file sizes / uses more memory		**3**

Question Number	Answer data	Additional Guidance	Mark
1(e)	An explanation such as: The file size is reduced (1) because repeated values (1) are assigned a number (that represents the count of the repeats) (1) OR File size is only reduced (1) if there are lots of run lengths of repeated values (1). In some instances, the 'compressed' file size is actually larger than the original. (1) OR Compressing a black and white image will produce a smaller file size (1) than producing a coloured image because only a single bit needed (1) to indicate the presence/absence of colour (1). OR There will be no loss of quality (1) because RLE is a lossless compression algorithm (1) meaning the exact bit pattern is represented (1)		**3**

Question Number	Answer	Additional Guidance	Mark

Question Number	Answer	Additional Guidance	Mark
5(a)	**One** from: • Instructions for the game do not change. • RAM is volatile. • Users aren't expected to alter the game's code or assets		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)	An explanation such as: To store actions /progress during the game (1) because this data is changeable (1) OR RAM stores data that can change (such as variable values) (1) which is needed to store scores/progress during the game (1)		**2**

Question Number	Answer	Additional Guidance	Mark
5(c)	A linked response to include **two** from: Logic allows for decisions to be made (1) enabling a range of options/pathways/scenarios to be provided (1) that can adapt to ability of the player / how the player plays (1) Example response: Logic is used to compute the output response (1) generated by the player's action given their location and the location and actions of other players in the game environment (1)		**2**

Question Number	Answer	Additional Guidance	Mark
5(d)i	000 0011 010 0101 (1) 000 0100 (1) 010 0001 111 0011 010 0001 000 0011 (1)		**3**

Question Number	Answer	Additional Guidance	Mark
5(d)ii	One mark for sight of each: • 10x9 (1) • x7 (1) • 10x9/15x7 (1) Award all four marks for a complete expression including minus sign and expressed with the correct order of operations. e.g. (10x9x7)-(10x9/15x7)	Award equivalent expressions e.g. • (10x9x7)-(6x7) • (90x7)-(6x7)	**4**

Original question 3

The full source mark scheme begins on page 51. Use the original paper code, tier and question number shown above.

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	**The only correct answer is A** *B is not correct because a kibibyte contains 8192 bits* *C is not correct because a mebibyte contains 8192 x 8192 bits* *D is not correct because a nibble contains 4 bits*	The correct answer is gibibyte	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	Award **one** mark for any of the following: • 2^7 (1) • 128 (1) • 2 × 2 × 2 × 2 × 2 × 2 × 2 (1)	Allow equivalent	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	Award **one** mark for: • 71 (1)		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	Award **one** mark for any of the following up to a maximum of **two** marks: • Base 16 number (1) • Needs 16 different symbols to represent the range of values (1) • Hexadecimal uses the digits 0-9 (to represent values between denary 0 and 9) (1) • Hexadecimal uses the letters A-F (to represent values between denary 10 and 15) (1) • Each hexadecimal symbol requires 1 nibble/4 bits to represent it (1) • Because there are **more** (hexadecimal) **digits/symbols** than there are (denary) digits, it uses letters (1)	Do not award responses comparing hexadecimal to binary/denary Do not award responses indicating 'number' instead of 'digit', without clarification (0-9, A-F) Responses must be related to characteristics and not benefits or drawbacks of hexadecimal notation.	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	Award up to **two** marks for a linked explanation such as: • Hexadecimal numbers are easy to understand/remember (1) because they contain fewer digits (than binary) (1) • Hexadecimal numbers are easier to read/write (1) because they are not just 1s and 0s (1) • Hexadecimal numbers are shorter/easier for programmers to read/write (1) because memory addresses are binary patterns (1) • Hexadecimal numbers are less prone to error when entering values (1) because there are fewer symbols to type (1) • Memory addresses are long binary patterns (1) so hexadecimal numbers are shorter/easier to read/write (1)	For both marks, the expansion must follow/associate with the statement. Do not accept 'easier' on its own without expansion as to what is easier.	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	Award up to **two** marks for a linked explanation such as: • Some frequencies/data can be removed permanently (1) because they are out of human hearing range (1) • Because the sounds/data outside the range of human hearing (1) can be completely removed (1) • Improves streaming (1) because it decreases the download time (1) • To achieve a higher compression ratio than lossless (1) because the sound will be understandable with some content removed (1) • More files can be saved (on a finite resource) (1) because it reduces the amount of storage space each file uses (1)	For both marks, the expansion must follow/associate with the statement. Do not award responses indicating quality of playback	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	Award **one** mark for each of the following: • 315 and 923 in the numerator (1) • 7 in the numerator (1) • 8 in the denominator (1)	Award equivalent expressions	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(d)(i)	**The only correct answer is C** *A is not correct because a shift has not been applied (0001 1100)* *B is not correct because 1101 1000 is the result of a left binary shift of 1* *D is not correct because 1011 0000 is the result of a left binary shift of 2*	The correct answer is: 0001 1011	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(d)(ii)	Award **one** mark for each nibble: 0001(1) 1001(1)	Nibbles must be in the right order Each nibble must be 4 bits	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(d)(iii)	Award **one** mark for each nibble: 1111(1) 0011(1)	Nibbles must be in the right order Each nibble must be 4 bits	**(2)**

edexcel

Mark Scheme (Results)

June 2015

Pearson Edexcel
GCSE Computer Science (1CP0/01)
Paper 1: Principles of Computer Science

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(a)</td><td>1 or 2 correct = 1 mark
3 or 4 correct = 2 marks
5 or 6 correct = 3 marks

<table>
<tr><th></th><th>Input</th><th>Process</th><th>Output</th><th>Neither</th></tr>
<tr><td>Actuator</td><td></td><td></td><td>x</td><td></td></tr>
<tr><td>Infrared Sensor</td><td>x</td><td></td><td></td><td></td></tr>
<tr><td>Wheel</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td>Calculate Distance</td><td></td><td>x</td><td></td><td></td></tr>
<tr><td>Programming Language</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td>Movement Sensor</td><td>x</td><td></td><td></td><td></td></tr>
</table>
</td><td></td><td>3</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
1(b)	• Data (1) • Instructions (1)		**2**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	• 121		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	• 122		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	• Any one of: ○ IF (statement) ○ IF….THEN…..ELSE ○ Selection ○ Conditional **If unsure, please send it to review**		**1**

Question Number	Answer	Additional Guidance	Mark
1(d)	0 0 0 0 1 1 0 0		**1**

Question Number	Answer	Additional Guidance	Mark
1(e)	1 1 1 1 0 0 1 0		**1**

Question Number	Answer	Additional Guidance	Mark
1(f)(i)	1 0 0 0 0 0 0 1		**1**

Question Number	Answer	Additional Guidance	Mark
1(f)(ii)	• The result of the calculation cannot fit into the size of the location assigned to hold it • Two 8-bit numbers added together resulted in a number that could not be stored in 8 bits • The addition resulted in a number >= 1 0000 0000 binary (note the overflow out of the destination field) • The result is >255 • The result needs 9-bits to store it	Do not accept - the number is too big - without further explanation	**1**

Question Number	Answer	Additional Guidance	Mark
1(f)(iii)	• Introduces errors in subsequent calculations • Compounds errors in subsequent calculations; snowballs • Signed numbers may change sign • Any indication that arithmetic performed on inaccurate calculated numbers results in subsequent inaccurate results	• Ignore examples	**1**

Question Number	Answer	Additional Guidance	Mark
1(g)	• Table or any other suitable notation Input | Output 0 | 1 1 | 0 • NOT (0) == 1 • NOT (1) == 0		**1**

Question Number	Answer	Additional Guidance	Mark
1(h)(i)	• NOT R column correct = 1 mark • First 2 rows correct of Q = 1 mark • Last 2 rows of Q = 1 mark **NOT R** | **Q** 1 | 0 1 | 1 0 | 0 0 | 0		**3**

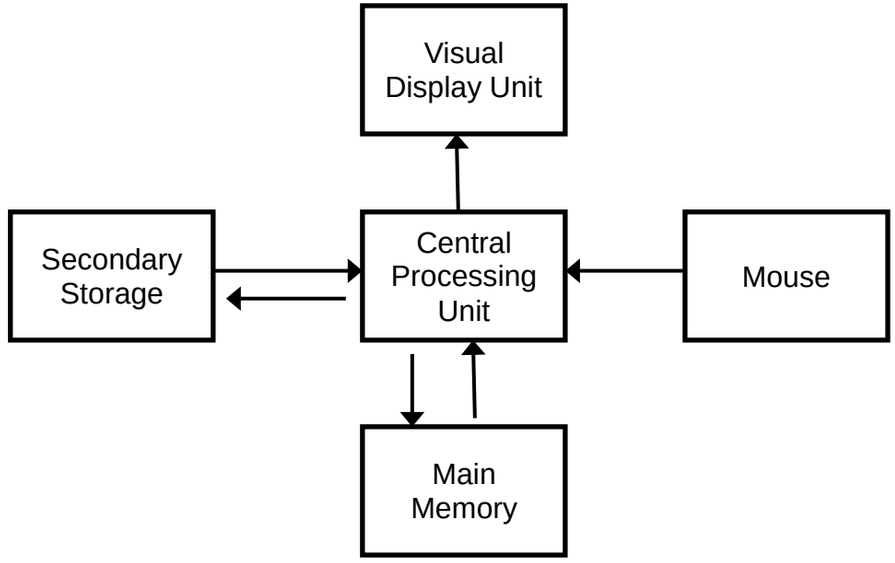
Question Number	Answer	Additional Guidance	Mark

1(h)(ii)	• Q=**(R OR B) AND S**
	• Alternative correct solutions should be awarded e.g.
	  ○ (R AND S) OR (B AND S)
	  ○ R AND S OR B AND S – works by order of precedence
		• **Q=** not required
		• Accept correct transpositions
		• Order of precedence is (); NOT; AND; OR
			1

Question Number	Answer	Additional Guidance	Mark
2(a)	Identifying any two (2) of the following (Maximum 2 marks): • Database • Bibliographic • Project Management • Presentation • Desktop Publishing • Word Processing • Web Browser • Image Editing • Video Editing • Email • Animation • CAD (not expected) • Programming Environment • Live Chat – Only if example confirms working context • Exclude software whose main purpose is entertainment • Any other appropriate software which could sensibly be used in a general working environment Any two (2) examples of software use (Maximum 2 marks): Answers may include • Image Editing – Cropping images for insertion into a presentation • Live Chat – For getting technical support help from a vendor support site • Web Browser – For looking up the address of a colleague at a	Do not accept spreadsheet and bee colonies Marks must be awarded 2 x 2 Identifying 4 applications cannot earn 4 marks Do not award brand names (Excel, Google, EndNote, PhotoShop, etc.) Use must follow example software given; if mismatch, then do not award example mark • Use must be appropriate for a "general" working environment • Do not award examples indicating entertainment • Use must be main purpose of application. Although word processors can crop	4

	different university • Presentation – Showing results of his research to colleagues at a conference. • Bibliographic – Keeping track of sources for his research. • Video Editing – Creating a video to put on YouTube of his lectures for his students. • CAD - molecular, synthetic, and genetic biology • Programming environment – Creating customised models	images, the more appropriate software choice would be an image/picture editor. • A programming language is not an application; an IDE, editor, or compiler is an application.	

Question Number	Answer	Additional Guidance	Mark
2(b)	Any 4 from: • Software can be redistributed • Source code is available • Source code can be modified • Modified code can be redistributed • A fee can be charged for the software • A fee is not usually charged for the software • Modified code must be made available under the same licence as original code. • Licence may require an acknowledgement of the original author to be included in the code. • Source code can be freely used, changed and shared by anyone subject to conditions specified in the license.	• Accept any other correct feature • Do not award "free" or "no cost" by itself	**4**

Question Number	Answer	Additional Guidance	Mark
2(c)	1 or 2 correct = 1 mark 3 or 4 correct = 2 marks 5 or 6 correct = 3 marks **If there are more than 6 arrows, 2 marks Max.**  **If unsure, please send it to review**	• Lines without direction cannot be awarded.	**3**

Question Number	Answer	Additional Guidance	Mark
2(d)	One mark for name and one mark for use (must match) • Control Unit (CU) ○ Sends signals to other components to coordinate the cycle • Arithmetic / Logic Unit (ALU) ○ Performs arithmetic (+,-,/,*, etc.) and logic (AND,NOT, OR, etc.) • Registers ○ Very fast storage locations which hold instructions, data, or memory addresses. • Cache (Not expected) ○ Sits between components in the microprocessor to make up for the difference in physical speed of the components • Address Bus ○ Holds the address of physical memory or the address of an input/output device that is to be read from/written to • Data Bus ○ If an instruction needs data, the data is loaded onto the data bus before being read by the CPU ○ All data/instructions moved here to go to or from Memory • Clock ○ Provides the timing for the cycle Other correct uses should be awarded.	• "Bus" or "Buses" alone is not awarded; must include qualifier. • Allow "arithmetic" or "logic" unit	**2**

Question Number	Answer	Additional Guidance	Mark
2(e)	Accept any **three** from the following. 1 mark each to a max of 3 marks: • The computer ***appears to be running*** more than one program/process at a time. • **More than one process can be loaded** into memory at one time. • Each process has its **own memory space**/partition. • Each process is given ***a small amount of time*** (time slice) to execute in the central processing unit. • Processes are held in a **queue/FIFO list**. • O/S **switches between processes** • Some processes may have **higher priority** than others may. • Higher priority processes may be **given more time** slices/processing time. • Processes can communicate by using shared memory	• Thread is accepted as equivalent to process • Program is accepted as equivalent to process There is a distinction between the assertion that "two programs ***are running*** at the same time" and that "two programs ***appear to be running*** at the same time". The first instance is an incorrect statement in the context of this question about a single microprocessor. As such, it cannot be awarded any marks. Ignore reference to multi-core processors.	**3**

Question Number	Answer	Additional Guidance	Mark
2(f)	Any two of: • Implement formulas which represent the relationships between the given data variables, such as hours of sun and quantity of honey. • Use a programming language to write a customised application to model the colony • Allow user to input initial values for data variables (food, sun) • Use graphical user interface components (boxes, sliders) to adjust input variables will show effects on outputs • Present outputs using graphs showing relationships between food and sun, etc. • Present outputs showing real number of bees and resources (yellow dots are bees; red dots are pollen) • Variables could be changed in real-time with immediate update to the screen (e.g. move a slider, the amount of pollen decreases) Any other appropriate and correct response incorporating modelling, simulation, or visualisation should be awarded.	The idea here is modelling, simulation, or visualisation of the real world context. Award positively any appropriate responses indicating that software can be used in this manner. Explicit connection to the context is required.	**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• Pixel(s) • Pel(s) • Not "picture element" as it is given in the following question	• Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	• Resolution or Pixel Density • Dots per inch, dpi • Pixels per inch, ppi • Dots per centimetre, dpcm • Pixels per centimetre, ppcm	• Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	• Colour depth • Bit depth is awardable	• Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
3(b)	One mark for each row **Category of secondary storage** magnetic optical solid state	Do not penalise spelling Do not award examples	**3**

Question Number	Answer	Additional Guidance	Mark
3(c)	Award 1 mark for each correct answer to a max of 2 marks • Any two of the following: ○ Timestamp ○ Sequence number ○ Version ○ Protocol type ○ Data ○ Flags ○ Size ○ Routing information ○ Any other appropriate answer	Do not accept source, destination, and check sum, which are provided in the question	**2**

Question Number	Answer	Additional Guidance	Mark
3(d)	• Identifying errors (introduced during transmission)		**1**

Question Number	Answer	Additional Guidance	Mark
3(e)	Divide 4096 by 1024 4096÷1024 4096MB / (1024 MB/GB) = 4 GB	• Ignore attempts to calculate an answer	**1**

Question Number	Answer	Additional Guidance	Mark
3(f)	• Internet (Any 1 of the following): ○ Interconnected networks of networks/machines**/hardware** ○ Geographically distributed networks/machines/hardware ○ Uses protocols for communication • World Wide Web (Any 1 of the following) ○ The **information** stored on the hardware ○ Pages of information stored on servers (pages written in HTML) ○ Uses HTTP / HTTPS to send/receive pages between servers and clients Accept any other correct comparison	• Only one topic addressed earns 1 mark max	**2**

Question Number	Answer	Additional Guidance	Mark
3(g)(i)	• Line numbers 5 – 10	Accept lines 4 - 11	**1**

Question Number	Answer	Additional Guidance	Mark
3(g)(ii)	• Any one of the following: ○ The tags refer back to line number 10/the "li" style ○ The <a> tags refer back to line number 6/the "a" style ○ The tags and <a> refer back to the information in the CSS	Allow: <a:hover> equivalent to <a> Allow: Missing </> tag in any description	**1**

Question Number	Answer	Additional Guidance	Mark
3(h)(i)	Amplitude		**1**

Question Number	Answer	Additional Guidance	Mark
3(h)(ii)	Any one of the following – 1 mark • (The more samples,) the smoother the digital representation of the original audio. • (Higher sampling rates) result in less distortion of the original audio • This makes the resulting digital representation more accurately match the original audio.	• Do not award "better", "better quality", or similar	**1**

Question Number	Answer	Additional Guidance	Mark
3(i)	Must have idea of ***runs*** (1) being compressed to ***a single item + a count*** of that item (1) Example: Simple mono-chrome icon will have long sequences of bits of same colour (1) Sequences/runs of identical data are translated/stored as a single data value and a count (1)		**2**

Question Number	Answer	Additional Guidance	Mark
4(a)	Any three of the following impacts: • Pollution (water, air, noise) resulting from the manufacturing process • High energy and water volumes needed for the manufacturing process • Mineral mining contaminates ground water • Mineral (copper, gold, silver, lithium) resource depletion • High energy use to keep machines cool with air conditioning or fans • Contain toxic components which means computing devices are hazardous waste • Batteries (laptop, lithium cells) disposal is hazardous and needs specialised disposal facilities • Computing devices sent to landfills contaminate ground and water resources • Any other appropriate responses as long as they're distinct from each other Any one of the following actions: • Check national and local legislation • Some countries/states/regions require sellers to recycle own waste • Research recycling facilities to see if e-waste is acceptable • Find if local/national/regional government agencies charge for collection and disposal of e-waste • Find sellers offering exchange old for new + cost purchase options • Find charities (local, regional) which take donations of old devices • Turn off machines when not in use to save energy. • Any other appropriate response as long as it is interpretable to match an impact.	• 3 marks maximum for environmental impacts • 1 mark maximum for suggestion to reduce environmental impact • Suggestion does not have to follow impact. • Example: Mining of minerals pollutes the water and depletes valuable mineral stocks. Ground water is contaminated by sending batteries to landfill sites. Energy can be saved by turning the machines off at night. (4 marks)	4

Question Number	Answer	Additional Guidance	Mark
4(b)	Any two of the following Easier / faster to: ○ Sort ○ Search (by using queries) ○ Produce reports ○ Analyse data ○ Keep organised	Do not accept: • Primary or foreign keys • Relationships • Tables • Relational Database	**2**

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	• Primary Key **Ignore additional information in the answer**	Do not accept 'Key' by itself	**1**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	• Foreign Key **Ignore additional information in the answer**	Do not accept 'Key' by itself	**1**

Question Number	Answer	Additional Guidance	Mark
4(c)(iii)	• Any one of the following: ○ To form a relationship between the tables ○ To make connections between the tables ○ To facilitate the use of queries across tables ○ To relate the records in one table to records in another		**1**

Question Number	Answer	Additional Guidance	Mark
4(d)	One mark for **UPDATE** with correct table name One mark for **SET** with correct field name and new value One mark for **WHERE** with primary key and value Example: • UPDATE tblOutlet SET (Outlet_Address = "360 Pinnacle Place") WHERE Outlet_ID=2;	Do not penalise spelling of field names or table prefixes Do not penalise capitalisation of key words Do not penalise minutiae of syntax such as brackets, semi-colons, quotes	**3**

Question Number	Answer	Additional Guidance	Mark
4(e)	Justification expected in context of the question: ○ Can represent a larger number of characters ○ 16-bit representation is larger than 8-bit representation Example (in context of question) ○ Foreign language characters (ö, ú, ê, ç) ○ Foreign language characters used as alphabet	Not applicable to context of question (do not award) Smiley (WingDings, DingBats…) Mathematical symbols Copyright and trademark Foreign currency symbols Any other symbols supported by Unicode	**1**

Question Number	Answer	Additional Guidance	Mark
4(f)	Any one of: • 0 – 255 • 255 - 0	Do not award 256. Do not award 255.	**1**

Question Number	Answer	Additional Guidance	Mark
4(g)	Any three of the following: ○ Server can embed scripts into HTML page ○ Script is executed on the server ○ Result of execution is sent back to the client as an HTML page ○ All processing takes place on the server, not on the client ○ No software plugins to install on client machines ○ Software updates and patches only performed on server ○ Faster than client-side scripting ○ More secure than client-side scripting	○ Do not credit 'Script may interact with a database'	**3**

Question Number	Answer	Additional Guidance	Mark
5(a)	Compiler – Any of the following: • Translates all the source code as a single block • Object code is produced which can be linked to other modules • Compilers can perform optimisation on object code • Generated executable does not need compiler to execute • Executable can be moved between machines independent of compiler • Executable file runs more quickly than an interpreter with source code • Needs to be recompiled with each code change therefore development is slower. Interpreter – Any of the following: • Code is translated one line at a time and immediately executed • Code needs the interpreter to be run • Code cannot be moved between machines, unless the interpreter is moved as well • Debugging could be easier as interpreter **immediately** identifies line with error • Readable source code may need to be given to people who use the program • Runs less quickly than an executable file • Very good for creating prototypes due to quick development environments Quality of Written Communication	• A bulleted list of advantages or disadvantages is only worth 2 marks max.	**6**

	• 1-2: Some basic points from **at least one** of the categories; No recommendation or recommendation is not justified; Spelling, grammar, and punctuation **errors hinder meaning**. • 3-4: At least one relevant point **from each category**; Includes recommendation with minimal justification. Spelling, grammar, and punctuation **errors occur**, but do not hinder meaning. • 5-6: Relevant points from **both categories**; Includes well-justified recommendation. Spelling, grammar, and punctuation are **used accurately** and meaning is clear. **Example:** A compiler translates all the code at one time. The program can be run on any machine. (One category only; no recommendation; QWC ok; 2 marks max) **Example:** A compiler can perform optimisation on the code to make it more efficient. An interpreter can't because it executes one line at a time. A compiler makes a program that can be run on any machine. A compiler would be better for the pupil. (Two categories; unjustified recommendation; QWC ok; 4 marks max) **Example:** A compiler translates source code in a whole block to make an executable file. The executable file can run on any machines with the target operating system. It does not need the compiler to run. An interpreter translates each line of source code one at a time and executes it. To run the program on another machine, you need the interpreter and the source code. I recommend a compiler for the pupil because it makes		

	giving the program to another person easier, as they don't need the interpreter. (Two categories; justified recommendation; QWC ok; 6 marks max) **Example**: I recommend an interpreter because: • Translates one line at a time • Easier to see errors • Good for quick development I don't recommend a compiler because: • It's slow • Have to give away interpreter as well as code (Two categories; justified recommendation; QWC unmarkable; 2 marks max)		

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	• (Line number) 3		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	9-16, both must be provided		**1**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(c)</td><td>

1 mark = 0-5 sequence under column i
1 mark = 78, 83, 72, 80, 83 sequence under column anArray[i]

<table>
<tr><th>b</th><th>f</th><th>i</th><th>anArray[i]</th><th>c</th></tr>
<tr><td>75</td><td>FALSE</td><td>0</td><td></td><td>-1</td></tr>
<tr><td></td><td></td><td></td><td>78</td><td></td></tr>
<tr><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>83</td><td></td></tr>
<tr><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>72</td><td></td></tr>
<tr><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>80</td><td></td></tr>
<tr><td></td><td></td><td>4</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>83</td><td></td></tr>
<tr><td></td><td></td><td>5</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td><td></td><td>2</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(d)	• Examples: ○ WHILE ((NOT f) AND (i < LENGTH (anArray)) DO ○ WHILE (NOT f) AND (i < 5) DO ○ WHILE (f = FALSE) AND (i < 5) DO ○ WHILE (NOT f) AND i < 5 DO ○ WHILE NOT f AND i < 5 DO ○ WHILE (i < LENGTH (anArray) DO	• Any sensible pseudocode is awardable • Brackets not required • Accept <= in place of <	1

Question Number	Answer	Additional Guidance	Mark
5(e)	Any one of: • Finding the ***location*** of a target number in an array • Finding the **position** of a number in an array	• "Finding a number in an array" is not awardable. • The idea of location is important because of the ***return*** statement value	1

Question Number	Answer	Mark

5(f)	• Flowcharts are not awarded, stated in question
	• Do not penalise pseudocode or programming language syntax errors, as long as logic is discernible
	• Many alternative solutions are possible and should be awarded
	  ○ Reading all measurements into an array and then processing, if correct, should be awarded
	  ○ STEP on FOR loop not required for mark
	  ○ Comments not required
	• For full marks, solution must be correct and work
		7

```
// Initialisation of variables
SET totalWeight TO 0

// Print prompt and get count of weights
SEND "How many weights do you want to enter?" TO DISPLAY
RECEIVE numWeights FROM (INTEGER) KEYBOARD

// Loop for count as entered
FOR i FROM 1 TO numWeights STEP 1 DO
    SEND "Enter a weight:" TO DISPLAY
    RECEIVE aFruit FROM (INTEGER) KEYBOARD

    // Add up as each weight is entered
    SET totalWeight TO totalWeight + aFruit
END FOR

// Find average and print out
SET averageWeight = (REAL) totalWeight / numWeights
SEND "Average weight is: %2d" + averageWeight TO DISPLAY
```

Initialise variables sensibly = 1 mark (**1.1.2**)
totalWeight must be set before first use, if used in calculation.

Retrieving count from keyboard = 1 mark (**2.4.1**)

Any loop control for multiple weights with correct bounds = 1 mark (**2.2.2**)

Adding up total inside loop = 1 mark (**1.1.2**)

Calculating average = 1 mark (**1.1.8**)
Output average = 1 mark (**1.1.2**)

Attempt to deal with INTEGER/REAL/STRING conversion = 1 mark, even if not correct (**1.1.2**)

Content Mapping Grid

Question	Specification	Marks
1a	4.1.3, 4.2.5	3
1b	3.1.1	2
1c(i)	4.2.3	1
1c(ii)	4.2.3	1
1c(iii)	2.2.2	1
1d	3.1.2	1
1e	3.1.2	1
1f(i)	3.1.4	1
1f(ii)	3.1.4	1
1f(iii)	3.1.4	1
1g	4.3.1	1
1h(i)	4.3.1	3
1h(ii)	4.3.2	1
2a	4.4.2	4
2b	6.1.4	4
2c	4.2.1	3
2d	4.2.2	2
2e	4.4.1	3
2f	4.4.3	2

Question	Specification	Marks
3a(i)	3.2.2	1
3a(ii)	3.2.2	1
3a(iii)	3.2.2	1
3b	4.2.4	3
3c	5.1.6	2
3d	5.1.7	1
3e	3.3.1	1
3f	5.2.1, 5.2.2	2
3g(i)	5.2.3	1
3g(ii)	5.2.3	1
3h(i)	3.2.3	1
3h(ii)	3.2.3	1
3j	3.3.3	2

Question	Specification	Marks
4a	6.1.2	4
4b	3.5.1	2
4c(i)	3.5.2	1
4c(ii)	3.5.2	1
4c(iii)	3.5.2	1
4d	3.5.3	3
4e	3.2.1	1
4f	3.2.4	1
4g	5.2.4	3
5a	4.5.2	6
5b(i)	2.2.1	1
5b(ii)	2.2.1	1
5c	2.1.6	2
5d	1.1.5	1
5e	1.1.3	1
5f	1.1.2, 2.4.1, 2.2.2, 1.1.8	7

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Mark Scheme (Results)

June 2022

Pearson Edexcel GCSE In Computer Science (1CP2/01) Paper 1: Principles of Computer Science

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	Any **two** from: • Can share files/data • Can share applications/software • Can collaborate • Can share peripherals (printers, speakers) • Can share connectivity (Internet connection, hotspot) • Can access files **from any computer / hot desk** • Central control/management (security, software updates, backup, remote support, users, remote monitoring) • Allows communication (email, social media, video conferencing, online meeting, collaborative games)		**2**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	A description such as: • A LAN covers a small (geographic) area / a WAN covers a large (geographic) area (2) • A LAN uses infrastructure owned by one company / a WAN uses third-party infrastructure (2) • A LAN connects individual devices / uses switches (1), whereas a WAN connects LANs / uses gateways (1)	Do not accept 'smaller/larger' in reference to the physical size of the network.	**2**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	B 17 080 000 *A 17 080 is not correct because it is 17.08 multiplied by 1000* *C 17 080 000 000 is not correct because it is 17.08 multiplied by 1000^3* *D 17 080 000 000 000 is not correct because it is 17.08 multiplied by 1000^4*	17 080 000 is 17.08 multiplied by 1000^2	**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(iv)	The delay/amount of time between data/signal being sent and it being received	Do not accept reference to delay/lag on its own.	**1**

Question Number	Answer	Additional Guidance	Mark
1(b)i **Clerical**	Any **one** from: • IP (address) • MAC (address)		**1**

Question Number	Answer	Additional Guidance	Mark
1(b)ii	A Data being sent *B is not correct because it is located in the header* *C is not correct because it is located in the header* *D is not correct because it is not located in a packet*		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)	A description to include two from: • Monitors/checks traffic (1) using a set of rules / list of authorised/unauthorised computers/addresses/protocols (1) to decide if data is allowed into or out of the network (1)		**2**

Question Number	Answer	Additional Guidance	Mark
1(d) **Clerical**	Any **one** from: • POP3 • IMAP • SMTP	Accept POP	**1**

Question Number	Answer	Additional Guidance	Mark
1(e)	A linked explanation such as: • All communication could fail (1) because/if the central device fails (1) • It can be difficult/expensive to set up (1) because each device needs a cable to connect to the central device (1) • The number of devices that can be connected is limited (1) because the central device supports a fixed number of connections (1)	For 'central device': • Accept 'router' or 'hub' (as a term to refer to a device that contains a switch). • Accept 'switch' (as this is the correct term to refer to the central device) • Do not accept 'server'	**2**

Question Number	Answer	Additional Guidance	Mark
2(a)i	Any **one** from: • To represent an instruction/command • To make an instruction/command easy to read/write/learn/remember/understand • An instruction in a set of instructions	Accept generic definitions of mnemonic such as: 'To shorten a piece of information so it is easy to remember.'	**1**

Question Number	Answer	Additional Guidance	Mark
2(a)ii **Clerical**	Assembly language		**1**

Question Number	Answer	Additional Guidance	Mark
2(a)iii	A linked description such as: • They are microprocessor/CPU/machine specific (1) so they can manipulate the hardware directly (1) • They can be highly optimised (1) to make efficient use of the hardware/execute more quickly/use minimal memory (1) • Each line of code (1) is one instruction only (1) Award responses that refer to machine code as a low level language, such as: • **Machine code** is written in binary (1) so instructions can be processed **directly** by the CPU / do not need to be translated (1) Award **one** mark for: • Machine code does not need to be translated (1)	Accept: (Assembly language) instructions are assembled (1) to machine code (1)	**2**

Question Number	Answer	Additional Guidance	Mark
2(a)iv **Clerical**	Interpreter		**1**

Question Number	Answer	Additional Guidance	Mark
2(b)	• Data • Instructions		**2**

Question Number	Answer	Additional Guidance	Mark
2(c)i	A description to include **two** from: A laser heats/burns (areas of a disk) (1), which creates lands/pits (1) representing binary / 1s and 0s (1)		**2**

Question Number	Answer	Additional Guidance	Mark
2(c)ii **Clerical**	Solid state / flash *Accept 'SSD' for solid state*		**1**

Question Number	Answer	Additional Guidance	Mark
2(d)	Any **two** from: • Limited processing resources • Low power consumption • Simple/robust operating system • Low cost per unit • Smaller in size • Less storage • Limited user interface	Do not accept: 'Carries out a specific task': This is the opposite of 'general purpose', which is given in the question.	**2**

Question Number	Answer	Additional Guidance	Mark
2(e) **Clerical**	A Reduces data transfer times C Reduces required storage space *B is not correct because parts of a compressed file can still be written to several different places on a disk* *D is not correct as compression does not make data more secure like encryption does* *E is not correct because error detection/correction mechanism are still needed in network packets*		**2**

Question Number	Answer	Additional Guidance	Mark
2(f)	Any **two** from: • Programming language specific vulnerabilities (directly manipulating memory) • Security (vulnerability) • Weak design • Insufficient testing • Bad programming practices (not following standards, using unvalidated 3rd party libraries) • Inadequate validation (that fails to prevent incorrect/inappropriate data input) • Inadequate authentication (that enables hackers to gain unauthorised access) • Sensitive data not encrypted		**2**

Question Number	Answer	Additional Guidance	Mark
2(g)	A linked explanation such as: • Users can be added/deleted (1) so multiple people can use the same computer (1) • Edit user permissions (1) so only specific users can securely access their storage space (1) • Control the amount of resources/storage each user can access (1) so the limited storage on the machine can be shared (1) • Enforce user permissions (1) so only certain users are allowed to install programs / access certain files (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(i) **Clerical**	1 mark for each nibble: 0011(1) 1001(1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii) **Clerical**	1 mark for each digit in the correct location: 2D		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	A linked description such as: • Flip all the bits (1) and add one (1) • Copy/keep all the 0s from the right/LSB, up to and including the first 1 (1), then flip the remaining bits (1) • Flip all the bits from the left/MSB (1) up to, but not including, the 1 nearest the right/LSB (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(iv)	A linked explanation such as: • There are not enough bits (1) to store the result (1) • An overflow occurs (1) because 1 + 1 = 0 with a 1 carry / because the result is more than 255 (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(b) **Clerical**	Lossy		**1**

Question Number	Answer	Additional Guidance	Mark
3(c)	A description to include **two** from: • A standard • For representing text/characters • Allows data to be interchangeable between computers (from different manufacturers) • Each character is mapped to a unique number/binary equivalent • ASCII (encoding) uses 7/8 bits • There are 128 unique characters (allow 256 for 128)	Award a mark for an example of an ASCII character equivalence e.g. A = 65 as this can be awarded from mark point 4. (A = 01000001 could similarly be awarded.)	**2**

Question Number	Answer	Additional Guidance	Mark
3(d)(i)	Any **one** from: • The number of pixels **per** (square) **inch** is higher • The density of pixels is higher		**1**

Question Number	Answer	Additional Guidance	Mark
3(d)(ii)	Award **one** mark for each number in the correct location for a maximum of 4: • 15 in numerator (1) • 1028 x 640 in numerator (1) • 1024×1024 in denominator (1) • 8 in denominator (1) Example of expression that gains full marks: $\frac{1028 \times 640 \times 15}{1024 \times 1024 \times 8}$	Award equivalent representations of 1024 (2^{10})	**4**

Question Number	Answer	Additional Guidance	Mark
4(a)	A linked explanation such as: • It helps prevent loss of data (1) because malware could deliberately delete data / because data can be deleted/corrupted accidentally (1) • It helps minimise disruption following a system failure (1) because data can be restored (1) • Data can be restored (1) because physical hazards (fire/flood) (can damage storage devices) (1)		**2**

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Question Number	Answer	Additional Guidance	Mark
4(b)	Any **two** from: • That they are giving consent • That they can say no / refuse • That they are not denied service, if they say no • What the data is being collected for • What processing will be done on their data/purpose of the processing/how data will be processed • That they can withdraw consent at any time • That the data will be shared (with third parties) • How long it will be stored • That the data will be stored securely		**2**

Question Number	Indicative content	Additional Guidance	Mark
4(c)	Discuss how algorithmic bias can affect the decisions police forces make. **Causes of algorithmic bias** • Machine learning having been trained using insufficient/inappropriate data • Human bias leading to discrimination and a lack of fairness • Poor design of the algorithm **Impacts on individuals and communities of algorithmic bias** • Deploying officers to the wrong areas • Individuals may feel as though they are being monitored/targeted/subjected to unfair treatment as a result of the output of a biased algorithm deploying too many officers / too few officers • Discrimination/equality (e.g. resourcing police more heavily in particular communities) • Feedback loops (if a model predicting crime rates based on historical arrest data is used to prioritise police resources, then arrests in high risk areas could increase further, reinforcing the imbalance) source **Methods available to reduce the risk of algorithmic bias** • Human oversight and 'sense checking' and confidence/error ratings of predictions • Governance (anticipating and managing risks and make sure legal requirements are adhered to) • Auditing to enable identification and mitigation of systematic bias • Open to scrutiny / transparent • Involvement of communities during development • Improve the training data		**6**

Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made, showing elements of understanding of key concepts/principles of computer science. (AO1) The discussion will contain basic information with little linkage between points made or application to the context. (AO2)
Level 2	3–4	Demonstrates adequate understanding of key concepts/principles of computer science. (AO1) The discussion shows some linkages and lines of reasoning with some structure and application to the context. (AO2)
Level 3	5–6	Demonstrates comprehensive understanding of key concepts/principles of computer science to support the discussion being presented. (AO1) The discussion is well developed, with sustained lines of reasoning that are coherent and logically structured, and which clearly apply to the context. (AO2)

Question Number	Answer	Additional Guidance	Mark
5(a)(i) **Clerical**	Any **one** from: • Array • List		**1**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii) **Clerical**	Yellow		**1**

Question Number	Answer	Additional Guidance	Mark
5(a)(iii) **Clerical**	Abstraction		**1**

Question Number	Answer	Additional Guidance	Mark
5(a)(iv) **Clerical**	Decomposition		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)	A linked description such as: • If the value of the item at the current index position in the array is more than the value of the target (1), no more passes of the loop are required / the loop will exit (1) • If the pass through the loop goes past the expected location of the target value (1), the third condition for the loop to execute will not be met (1) • If the value (of 'theTarget') is exceeded without reaching the end of the array (1) the algorithm will end (1)	Do not accept 'index' in place of 'the value at the index'.	**2**

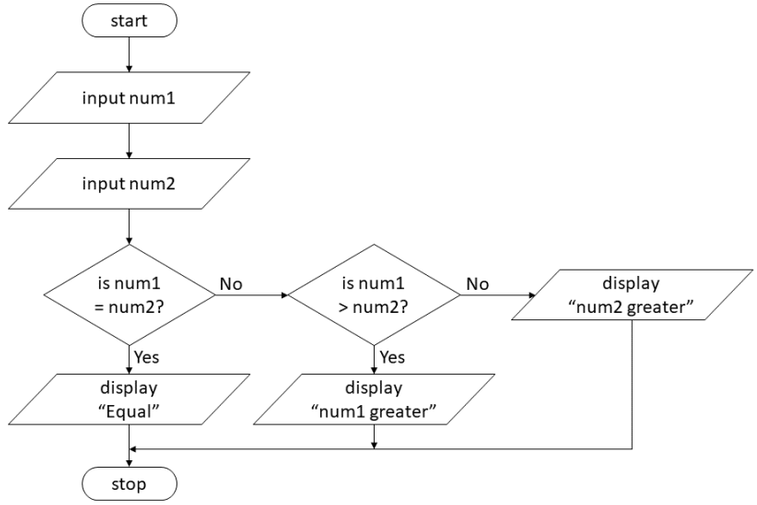
<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(c)</td><td>One mark for each correct row showing relationship of variable changes.
<table>
<tr><th>count</th><th>accept</th><th>reject</th><th>weight</th><th>Display</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td></td></tr>
<tr><td>1</td><td>1</td><td></td><td>404</td><td></td></tr>
<tr><td>2</td><td></td><td>1</td><td>393</td><td></td></tr>
<tr><td>3</td><td>2</td><td></td><td>395</td><td></td></tr>
<tr><td>4</td><td>3</td><td></td><td>405</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>3 1</td></tr>
</table></td><td>Different versions of trace tables are acceptable.

Blanks can be replaced with contents of previous row.

Final ‘3 1’ can be included on row above.

Ignore formatting of 3 1 in Display column (e.g. accept ‘3,1’)

Allow ‘Enter weight of box:’ in Display column until 3 1 should be displayed.</td><td>6</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(d)	• Both start and stop terminators present **and** algorithm terminates correctly at the stop terminator (1) • Two separate inputs for two integers (1) [can be in the same input symbol] • Test for equivalence, greater than or less than in one decision box (1) • Different test (for equivalence, greater than, or less than) in separate decision box (1) • Two outputs, labelled Yes and No, for each decision box (1) • Logic of flowchart links to **three** logically valid outputs (1) 	• Award 'End', 'Stop', 'Start' and 'Begin' as text for terminator symbols. • Award '==' and '=' used for equivalence inside decision symbol. • Accept 'Print' or 'Output' as an alternative to 'Display' in the output symbols. No quotes required around output string. • Accept True/False for Yes/No labels	**6**

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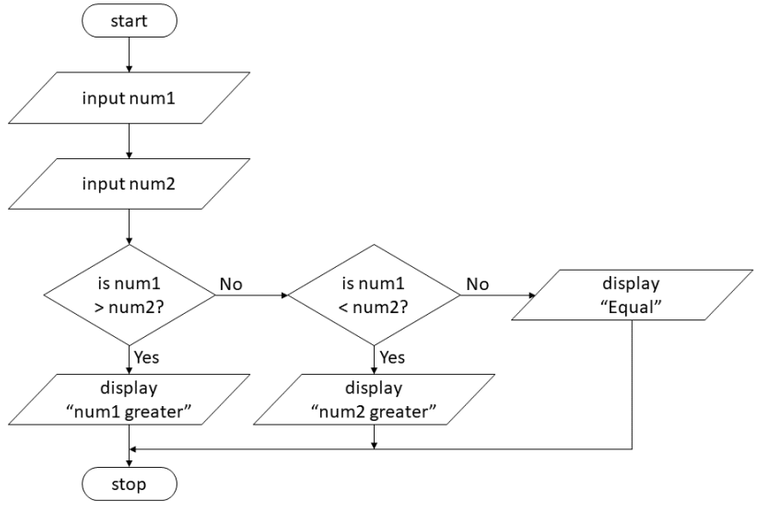

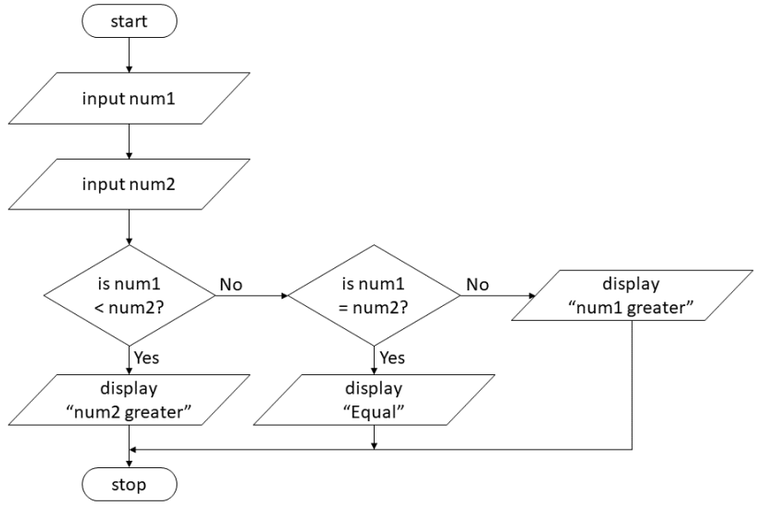

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Question 3 (a)(i)

The majority of candidates gained both marks.

Question 3 (a)(ii)

Almost three-quarters of the candidates gained both marks.

Question 3 (a)(iii)

There was good understanding shown of the method to convert into two's complement.

(iii) Describe the process of converting a binary number to two's complement.

(2)

Write the number in Binary then you now copy the number from the right until you copied the first 1. After that you flip the numbers around (eg 0 to 1) to get your final answer. in negative form.

ResultsPlus
Examiner Comments

This response is worth 2 marks: copying all the numbers from the right and then flipping the remaining numbers.

Total: 2 Marks

Question 3 (a)(iv)

The most frequent response was overflow error. There was clear understanding from most candidates, here.

(iv) Explain what has happened as a result of adding these two 8-bit binary numbers.

	1	0	1	1	0	0	0	1
	1	0	1	0	1	1	0	0	+
1	0	1	0	1	1	1	0	1	

(2)

An overflow Error. This is when the result of the binary calculation is too large ~~for~~ for the space allocated. In this case, the result is too large for 8-bit binary.

ResultsPlus Examiner Comments

'overflow' gained a mark.

'The result of the calculation is too large' is too vague to award a mark for 'result more than 255' on its own.

However, the response then clarifies this with 'for the space allocated' – gaining the mark for 'not enough bits'

The response then goes on to state 'the result is too large for 8-bit binary'.

Total:2 Marks

(iv) Explain what has happened as a result of adding these two 8-bit binary numbers.

	1	0	1	1	0	0	0	1
	1	0	1	0	1	1	0	0 +
1	0	1	0	1	1	1	0	1

(2)

There is an additional one, this due to the adding binary rule of 1+1=1 carry a 1, which led to an additional 1 being carried and added.

ResultsPlus Examiner Comments

This response is not accurate as related to this example.

It has to be 1+1=0 carry 1 because that is what has caused the overflow in THIS case.

Total: 0 Marks

Question 3 (b)

The majority of candidates gained the mark.

Question 3 (c)

Good answers saw almost half of the candidates gain full marks.

A few assumed ASCII was a programming language.

The most frequent responses were a character set, using 7 bit, 128 characters.

Some candidates gained the 'standard' mark for the full definition of American Standard Code for Information Interchange.

Many candidates correctly stated the ASCII allows for the representation of character.

However, it is notable that many candidates were incorrectly stating the nature of ASCII as conversion, or even encryption.

(c) Data can be encoded using ASCII.

Describe ASCII.

(2)

each letter is represented as a number.

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Examiner Comments

There is enough information to imply that each character is mapped to a unique number but 'letters' is not enough to relate to 'text' in mark point 2.

If the response were 'each character is represented as a number' it would have been awarded two marks, because it shows the idea of mapping, and that it is a way of representing characters.

Total: 1 Mark

(c) Data can be encoded using ASCII.

Describe ASCII.

(2)

ASCII is a 7 bit computer language that contains ~~the number~~ 127 (0-126) different letters, numbers and symbols. But it only in American English, so does not work for languages that have a different alphabet.

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Credit is only available for:

- 7-bits (1)

Containment is not the same as representation.

127 is not 128.

The rest of the response does not gain any marks.

Total: 1 Mark

Question 3 (d)(i)

The most common misconception was ‘more pixels’.

Many candidates responded with 'higher bit depth' or 'more quality'.

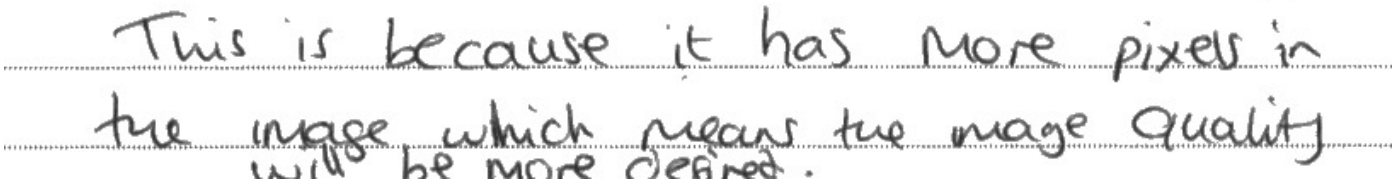
(d) A pixel is the smallest element in a bitmap image.

(i) Two images are displayed on the same screen.

One image is 1280 × 720 pixels. The second image is 1920 × 1080 pixels.
The second image has a higher resolution.

State **one** reason why the second image will be displayed in more detail.

(1)



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Examiner Comments

Not enough understanding is shown in this response.

Total: 0 Marks

Question 3 (d)(ii)

Almost half of the candidates gained all four marks.

(ii) A 10-colour bitmap image uses 15-bit colour depth. The image is 1028 pixels wide and 640 pixels high.

Complete the expression to show the minimum file size for the image in MiB.

You do not have to do the calculation.

(4)

$$\frac{10 \times 15 \times 1028}{1024 \times 1024 \times 1024}$$

ResultsPlus Examiner Comments

This response receives marks for:

- 15 in the numerator (1)
- 1024 x 1024 in the denominator (1)

Total: 2 Marks

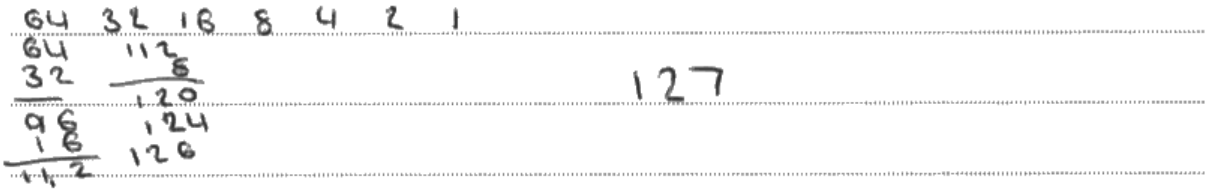
Question 1(a)ii

Most candidates responded correctly giving either 128 or 2^7.

Some candidates gave 127 which is the largest number that can be represented with 7 bits, but is not the total number of unique representations.

(ii) State the number of unique values that can be represented with 7 bits.

(1)



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Examiner Comments

This response scored 0 marks for an incorrect value. It was off-by-one exemplifying a typical candidate misconception giving the largest number that can be represented rather than the number of unique values.

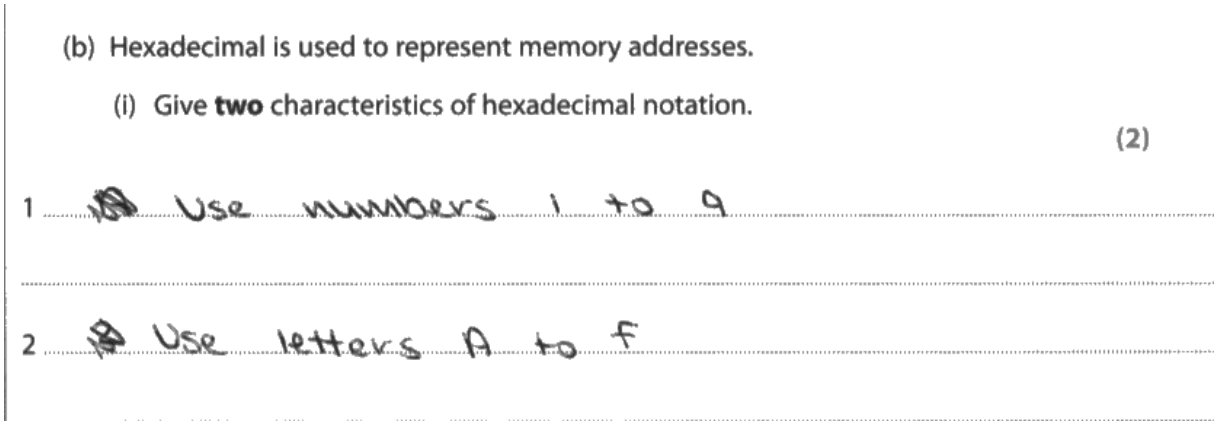
Question 1(a)iii

Most candidates gave the correct ASCII code for G which was 71.

Question 1(b)i

Candidates sometimes confused the benefits of using hexadecimal with its characteristics, giving the benefits of using hexadecimal rather than focusing on its intrinsic characteristics. The characteristics are the features of the notation. Where candidates gave characteristics, they were sometimes too vague. For example, specifying 'letters' rather than 'letters A to F are used'.

Some candidates also stated that hexadecimal digits went from 1 to 9 instead of specifying from 0 to 9.


(b) Hexadecimal is used to represent memory addresses.

(i) Give **two** characteristics of hexadecimal notation.

(2)

1 Use numbers 1 to 9

2 Use letters A to F

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Examiner Comments

This response scored 1 mark for stating that hexadecimal uses letters A to F. To gain the second mark the candidate would have needed to state that numbers/digits 0 to 9 are used as well, and not just 1 to 9.

Question 1(b)ii

Many candidates were able to identify a reason why programmers use hexadecimal notation such as that it is easier to read or write, but fewer were able to give the required linked explanation to give the reason for their assertion. A number of candidates wrote that hexadecimal took less storage space than binary which is incorrect - the amount of bits required to store the value is identical.

(ii) Explain **one** reason why programmers use hexadecimal to specify memory addresses.

(2)

one reason why programmers use Hexadecimal is because it is easier for ~~them~~ other programmers to understand.

ResultsPlus Examiner Comments

This response scored 1 mark for identifying that hexadecimal is easier to understand/use, but there was no expansion to give a reason to explain why this was the case for the second mark.

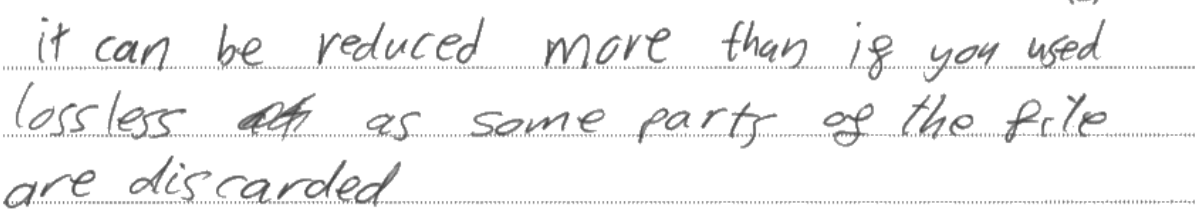
Question 1(c)i

Some candidates confused lossless compression with lossy compression. Many candidates were able to state that lossy compression would give higher compression ratios by removing data that would be outside the range of human hearing. Other popular reasons related to decreased file sizes for improved streaming by reducing download times.

(c) Audio and image files store data in binary.

(i) Explain **one** reason why lossy compression is used to reduce the size of an audio file.

(2)



ResultsPlus
Examiner Comments

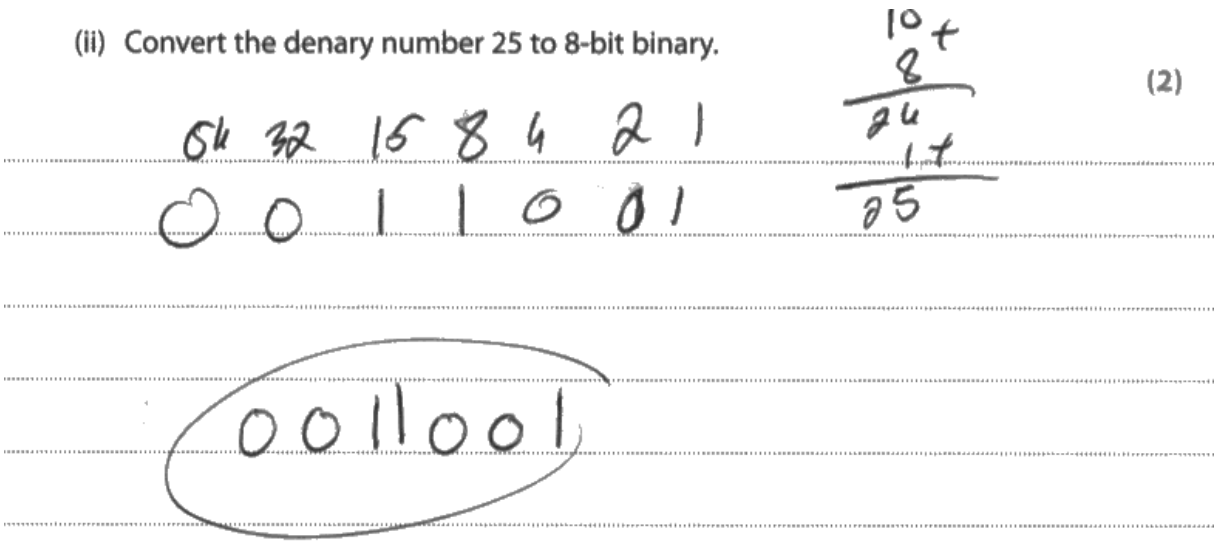
This response scored 2 marks without specifically relating to the context of lossy compression for audio. It did identify that lossy compression would achieve a higher compression ratio because some of the original data was discarded.

Question 1(c)ii

Most candidates scored at least one mark for multiplying the width (315) by the height (923) and many went on to give fully correct responses. Common errors included confusing the colour depth of 7 with 2^7 for the number of colours available and dividing by 1000 in an attempt to convert to KB rather than dividing by 8 to convert the total number of bits into bytes. A number of candidates also left one or more of the boxes empty rather than attempting to create a solution.

Question 1(d)ii

Candidates showed improved mathematical skills with the majority of candidates being able to convert an unsigned denary integer into binary. Some candidates converted the denary number 25 to the binary pattern 11001 rather than the 8-bit binary pattern 0001 1001, so scored one mark because they gave one correct nibble rather than two correct nibbles.



ResultsPlus Examiner Comments

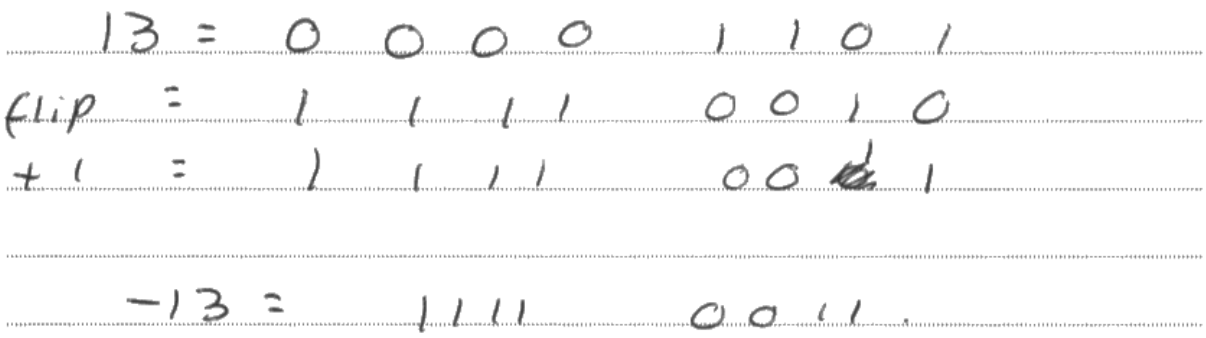
This response scored 1 mark. The response was not a full 8-bit binary number, but the right hand nibble could be identified to score a mark.

Question 1(d)iii

Fewer candidates were able to convert a negative denary integer into an 8-bit binary number using two's complement compared to a positive number conversion in d(ii). Where candidates attempted the conversion and produced incorrect responses, it was often because they tried to do the conversion by writing the positive value for -13 which was 0000 1101 and then flipping the bits to give 1111 0010, but then forgetting to add one. Many candidates also wrote out a number line starting with -128 for the most significant bit and then successfully completed the conversion using that technique.

(iii) Convert the denary number –13 to 8-bit binary using two's complement.

(2)



ResultsPlus Examiner Comments

This response scored 2 marks for a correct answer. It exemplified the method of flipping the bits and adding one to convert between positive and negative representations of numbers using two's complement.