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GCSE COMPUTER SCIENCE

4.1

Edexcel 1CP2 | Specification point 4.1.5

That network speeds are measured in bits per second (kilobit, megabit, gigabit) and be able to construct...

Untiered

Answers and examiner comments

8	2015-2024	Untiered
question groups	available papers	tier

Using this booklet

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

Name _____ **Date** _____

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

Original question 3

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

Original question 2

The full source mark scheme begins on page 55. Use the original paper code, tier and question number shown above.

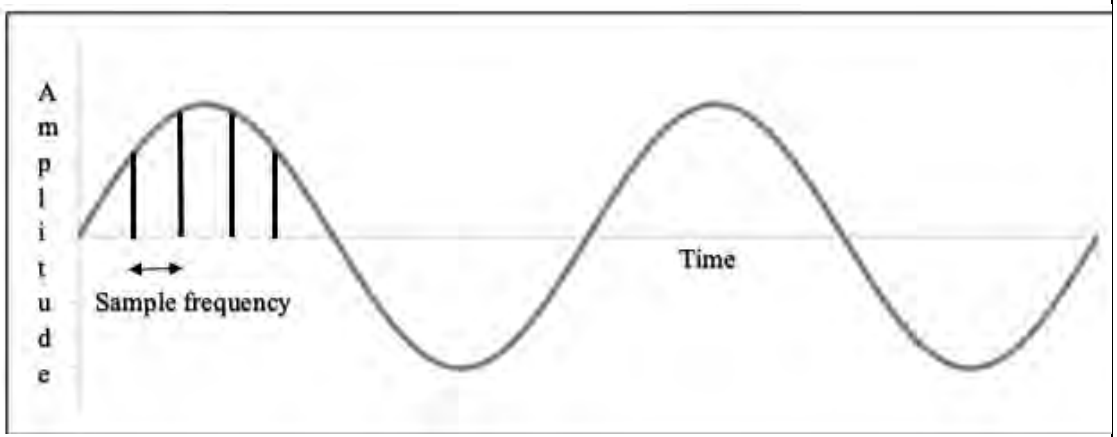
Question Number	Answer	Additional Guidance	Mark
3(a)(i)	Any two from different categories: • Share peripherals/devices (e.g. printers, scanners) (1) • Communicate (e.g. email, instant messaging, play games) (1) • Share data (e.g. files/music/videos/backups on servers) (1) • Deploy/update applications (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	Any three from: • May not have space for cables to be installed (1) • Employees and visitors can move around the building without disconnecting (1) • Adding new users just means giving out the SSID and password (1)		**3**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	Most people do not notice (1) And one from: …because: • People have a limited hearing range (1) OR • Sounds (frequencies/amplitudes) can be masked by other sounds (1) OR • People's brains will 'fill in the blanks'	Max 1 mark without first statement.	**2**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	May increase the file size / the file may not be compressed very much/at all (1) if characters are distributed randomly/not repeated/no runs of similar characters are found (1).		**2**

Question Number	Answer	Additional Guidance	Mark
3(c)	Total number of bits to transfer: 1 mark for 81×1024^2 1 mark for x 8 Speed in bits per second: 1 mark for 54×1000^2 Time = number of bits / bits per second: $\frac{81 \times 1024 \times 1024 \times 8}{54 \times 1000 \times 1000}$ 1 mark = number of bits in numerator 1 mark = number of bits per second in denominator	• No units required • Any equivalent expression to be awarded	**5**

Question Number	Answer	Additional Guidance	Mark
4(a) (i)	X axis correctly labelled (1) Y axis correctly labelled (1) Sample frequency indicated (1) Do not award marks if wavelength is labelled, rather than sample frequency. Accept for sample frequency if two points given that are shorter than the wavelength.  		**3**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	The amplitude / original sound can be represented more accurately. Accept: • Better (sound) quality • Higher fidelity • Clearer (sound)		**1**

Question Number	Answer	Additional Guidance	Mark
4(b)	B – RAM **The only correct answer is B** ***A*** *is not correct because the ALU does not hold a program* ***C*** *is not correct because a hard drive does not hold a currently executing program* ***D*** *is not correct because the control unit does not hold a program*		**1**

Question Number	Answer	Additional Guidance	Mark

4(c)	Total number of bits to transfer: **1 mark for** 20×1024^2 **1 mark for** $\times 8$ Speed in bits per second: **1 mark for** 2×1000000 Numerator/Denominator: **1 mark for** $$\frac{bits\ to\ transfer}{bits\ per\ second}$$ e.g: $$\frac{\mathbf{20 \times 1024 \times 1024 \times 8}}{\mathbf{2 \times 1000000}}$$	Any equivalent expression to be awarded	**4**

Question Number	Answer	Additional Guidance	Mark
4(d)	A description such as: • Input from sensor (1) • The input level is compared against pre-set values (1) • Output to LED/speaker (1)		**3**

Question Number	Answer	Additional Guidance	Mark
4(e)	A. Copper cable B. Fibre optic		**2**

3(a)	An explanation such as: Access to the network/Internet will be removed/unstable (1) because IP addresses have to be unique (1) *Award one mark for a response such as:* *So that data is routed to the correct recipient*	Example response: 'Devices must have a unique IP address (1) because otherwise, a switch would not know which of the two was the correct device to send packets to (1)	**2**

Question Number	Answer	Additional Guidance	Mark
3(b)	D – Star		**1**

Question Number	Answer	Additional Guidance	Mark
3(c)	((3 X 1000 X 1000 X 1000) ÷ 8) x 10 1 mark for 3 x 1000^3 1 mark for ÷ 8 1 mark for x 10		**3**

Question Number	Answer	Additional Guidance	Mark
3(d)	B – 4		**1**

Question Number	Answer	Additional Guidance	Mark
3(e)	B – Utility		**1**

Question Number	Answer	Additional Guidance	Mark
3(f)	C – SMTP		**1**

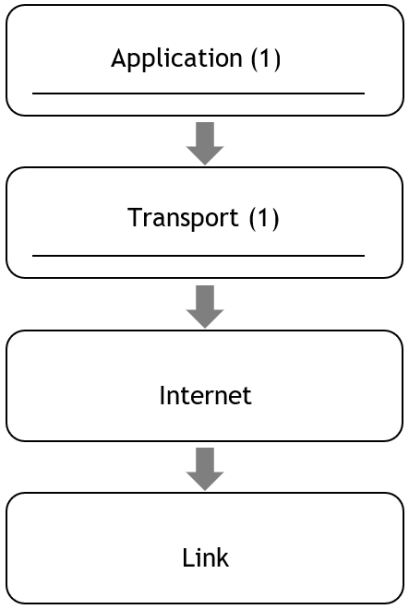
Question Number	Answer	Additional Guidance	Mark
3(g)	To provide access to the Internet		**1**

Question Number	Answer	Additional Guidance	Mark
3(h)	C - Structured		**1**

Question Number	Answer	Additional Guidance	Mark

Original question 1

The full source mark scheme begins on page 85. Use the original paper code, tier and question number shown above.

Question Number	Answer	Additional Guidance	Mark
2(a)	Award one mark for each of:  	Award one mark if both layers are named correctly, but in the wrong order Allow alternatives, such as Process and Host-to-host	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)	Award one mark for: • Bus (topology) (1)		(1)

Question Number	Answer	Additional Guidance	Mark
2(c)	The only correct answer is D *A is not correct because files can be encrypted without the computers holding them being connected in a network* *B is not correct because unconnected computers are at less risk than connected computers* *C is not correct because latency is a network metric, not a reason to connect devices*		(1)

Question Number	Answer	Additional Guidance	Mark
2(d)	Award one mark for any of the following: • HTTP (1) • HTTPS (1) • Hypertext Transfer Protocol (1) • Hypertext Transfer Protocol Secure (1)		(1)

Question Number	Answer	Additional Guidance	Mark
2(e)	Award up to two marks for a linked explanation such as: • Emails can be accessed from multiple devices (1) because IMAP does not remove/delete emails (from the server) (1) • Emails can be accessed through a browser (1) because IMAP doesn't need a client application to download messages (1)	For both marks, the expansion must associate with the statement.	(2)

Question Number	Answer	Additional Guidance	Mark
2(f)	Award up to two marks for a linked explanation such as: • (Digital/biometric) locks / magnetic card scanners / security personnel could be put on the office door (1) to prevent unauthorised access (1) • Movement sensors (1), to activate an alarm/ a light (1) • Security lights / alarms (1), so that intruders would be scared off / identified (1) • Alarms / alerts could trigger (1) because there is unauthorised access (1) • The servers/assets could have security tags (1), so that the owner can be tracked if stolen (1) • ID cards could be issued to all staff (1) to prevent impersonation/to allow unknown people to be challenged (1) • Warning posters could be positioned at entrances (1) to make people aware of shouldering/tailgating/two people entering together (1)	CCTV given in the question For both marks, the expansion must associate with the statement.	(2)

Question Number	Answer	Additional Guidance	Mark
2(g)	Award one mark for any of the following: • The **maximum** volume/amount of data that can be transmitted (in one second/unit of time) (1) • The **full capacity** of data that can be transmitted (in one second) (1)	Response must be about capacity of transmission, i.e. the maximum that can be transmitted, not how much/how fast data is currently being transmitted.	(1)

Question Number	Answer	Additional Guidance	Mark
2(h)	Award one mark for any of the following up to a maximum of two marks: • Read the destination/recipient's IP address (in each packet) (1) • Uses a routing table (1) • Sends the data packet **to the next router** (1) • Uses the fastest/least congested route/pathway (1) • Keeps track / informs other routers of traffic conditions (1)		(2)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	Award one mark for any of the following: • LAN (1) • Local area network (1)	Allow: Wireless LAN (WLAN) Personal Area Network (PAN)	(1)

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	Award one mark for any of the following: • Range (1)	Do not allow length / distance	(1)

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	Award one mark for any of the following up to a maximum of two marks: • The whole network stops working if the backbone/cable is broken (1) • The number of collisions increases/the network will slow down as the number of devices/users increases (1) • A greater security risk (because all the nodes on the network see all the data packets) (1) • The network stops working if the terminators are missing/not working (1) • Only one device can transmit data at a time (1)	Do not award responses associated with installation, either cost, extra wires, or invasiveness	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)	Award up to two marks for a linked description, such as: • It is an authorised attack (black box/white box) on a network/system (1) to identify security vulnerabilities (1) • It is a network/system attack carried out with the knowledge of an organisation (1) to recommend measures that should be taken to improve security (1)	For both marks, the expansion must follow/associate with the statement.	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	Award one mark for: • Wi-Fi (1) • Bluetooth (1)	Ignore capitalisation and hyphenation Allow ZigBee	(1)

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	Award one mark for any of the following: • File Transfer Protocol (1) • FTP (1)	Ignore capitalisation	(1)

Question Number	Answer	Additional Guidance	Mark
3(d)	Award up to two marks for a linked description, such as: • It converts the data into a suitable signal/electrical/radio (1) for transmission on the media Ethernet cable/Wi-Fi (1) • It uses/adds a physical/MAC address (1) for a source/destination (1) • Receives data from the network layer (1) to send via physical hardware (1)	For both marks, the expansion must follow/associate with the statement.	(2)

Question Number	Answer	Additional Guidance	Mark
3(e)	Award one mark for: • 13 x 60 or 780 (seconds) (1) • $1.4 \times 8 \times 1024^3$ (1) • 1000^2 (1) • Fully correct response (1) Example: $$\frac{1.4 \times 8 \times 1024^3}{13 \times 60 \times 1000^2}$$	Award equivalent expressions	(4)

edexcel

Mark Scheme (Results)

June 2015

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

ALWAYS LEARNING PEARSON

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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>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(b)</td><td>• Data (1)
• Instructions (1)</td><td></td><td>2</td></tr>
</table>

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**

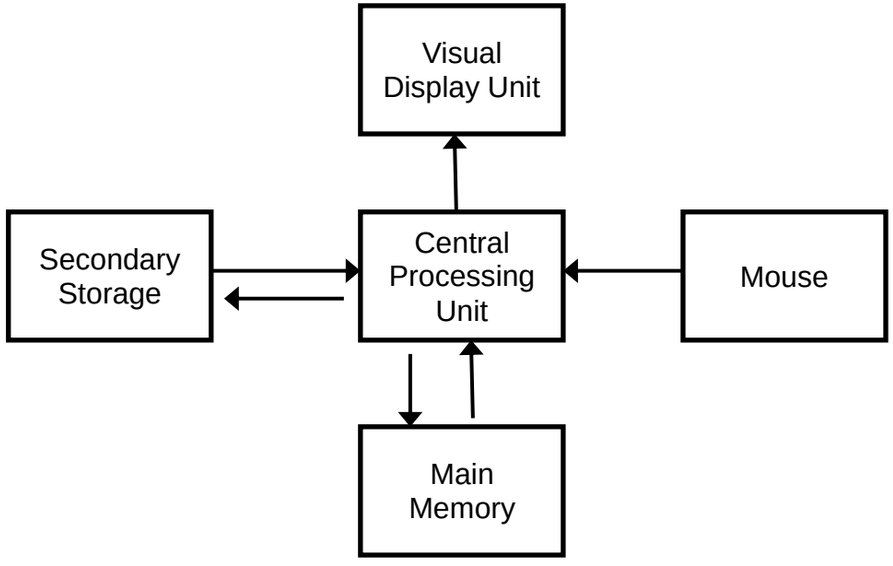
Question Number	Answer	Additional Guidance	Mark
1(h)(i)	• NOT R column correct = 1 mark • First 2 rows correct of Q = 1 mark • Last 2 rows of Q = 1 mark **NOT R** | **Q** 1 | 0 1 | 1 0 | 0 0 | 0		**3**

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>
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<tr><td></td><td></td><td></td><td>72</td><td></td></tr>
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<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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edexcel

Mark Scheme (Results)

Summer 2016

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.

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Question Number	Answer	Additional Guidance	Mark
1(a)(i)	Any one of: • To allow connected machines to communicate • To provide the rules of communication between two networked devices	Any other response indicating communication	**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	Any one of: • Backbone • Connecting backbone • Internet backbone • Fibre backbone • Network backbone		**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	Ring		**1**

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

<table>
<tr><th>LAN</th><th>WAN</th><th>PAN</th><th>VPN</th></tr>
<tr><td></td><td></td><td>X</td><td></td></tr>
<tr><td>X</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>X</td></tr>
<tr><td></td><td>X</td><td></td><td></td></tr>
</table></td><td></td><td>4</td></tr>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(b)(i)</td><td>Any one of:

• To keep information private/secure/secret as it is being transmitted across networks
• So that unauthorised persons will not be able to translate/understand the transmitted data</td><td>Do not accept:
• to keep secure when stored on devices, which is not the context of the question</td><td>1</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(b)(ii)</td><td>
<table>
<tr><th>Plain Text</th><th>Shift</th><th>Cipher Text</th></tr>
<tr><td>d i g i t</td><td>+3</td><td>g l j l w</td></tr>
<tr><td>b i n a r y</td><td>-2</td><td>z g l y p w</td></tr>
</table>
</td><td></td><td>2</td></tr>
</table>

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

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	6 E	Ignore case	**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	1 1 0 0 0 1 0 0	Ignore spacing Must be 8-bits	**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(iv)	Any one of: • 2^n and n=8 • 2^8 • 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 • 2^4 x 2^4 • 2^2 x 2^2 x 2^2 x 2^2 • Any other appropriate formula giving a result of 256		**1**

Question Number	Answer	Additional Guidance	Mark
1(d)(i)	Any one of the following: • Data is permanently lost (during the compression process) • Resolution is lost in images, (usually where it will not be noticed by the human eye) • Signal is degraded in audio files, (usually not noticeable to the human ear)	Accept answers that indicate a loss of quality	**1**

Question Number	Answer	Additional Guidance	Mark
1(d)(ii)	Any one of: B = JPEG		**1**

Question Number	Answer	Additional Guidance	Mark
1(e)	One mark for each of: • X-Dimension = 2 • Y-Dimension = 3 Examples: • (2,3) • X=2, Y=3	Values of 2 and 3 alone, with no indication of ordering, cannot be awarded. Accept any other notation clearly indicating (x,y) ordering and values	**2**

(Total for Question 1 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)			**3**

EU Cookie Law (e-Privacy Directive)	Computer Misuse Act	Copyright, Designs, and Patents Act
		X
	X	
X		

Question Number	Answer	Additional Guidance	Mark
2(b)(i)			**4**

High-Level Programming Language	Low-Level Programming Language
X	
	X
X	
	X

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	Comment(s) / Annotation(s)	Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	cubeNum	Do not penalise spelling Do not award if other information from function header is provided because the question asks for name only.	**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(iv)	Any one of: • 18 to 22 • 18 - 22 • 18, 19, 20, 21, 22 • 18, 20, 22	Entire range must be provided Award any discernible notation	**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(v)	Any one of: • 25 • 27		**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(vi)	Any one of: • 10 • 19 • 21 • 23		**1**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	First box = $\frac{1}{2}$ or equivalent expression for 1 mark / 0.5 Second box = $\frac{1}{4}$ or equivalent expression for 1 mark / 0.25 Conversion = $2\frac{3}{4}$ or equivalent expression for 1 mark / 2.75		**3**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	4		**1**

Question Number	Answer	Additional Guidance	Mark
2(c)(iii)	One mark for: • Numerator (top) calculation • Denominator (bottom) calculation Any of the following: $\frac{\left(\frac{10Kilobytes}{1}\right)\left(\frac{1024bytes}{Kilobytes}\right)\left(\frac{8\ bits}{byte}\right)}{\left(\frac{10Megabits}{Seconds}\right)\left(\frac{1000Kilobits}{Megabits}\right)\left(\frac{1000\ bits}{Kilobits}\right)}$ $\frac{10\ \times 1024\ \times 8}{10\ \times 1000\ \times 1000}$ $\frac{81920}{10000000}$ $\frac{8192}{1000000}$ Any other correct calculation where the unit conversions are discernible.		**2**

(Total for Question 2 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	One mark for each concept: Organisation of files is in a **hierarchy/tree** structure A **node** is either a folder/directory/sub-folder/sub-directory or the file itself The top node/folder/directory/drive is the **root**		**3**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	One mark for each concept: The client makes a connection / shares its IP with the server The client machine (web browser) **sends a request to the server** for a web page The server machine **sends the (requested) page back** to the client machine		**2**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	One mark for One mark for both items in One mark for inside Example (3 marks) - Socket - Open Ended Example (2 marks) - Socket Example (1 mark) - Socket - Open Ended	Ignore formatting as long as enclosure <> and </> are correct	**3**

Question Number	Answer	Additional Guidance	Mark
3 (c)(i)	Any two of: • Library code has already been debugged, so it should not have a bug • Library code has already been tested, so it should produce the correct results • Using libraries can reduce the time needed to develop a solution • Library code is usually optimised/faster than own code • Library code can be reused many times without having to rewrite the code	Do not accept just 'saves time'	**2**

Question Number	Answer	Additional Guidance	Mark

3(c)(ii)	One mark for each of (**in this order only**):
	
	1. AND
	2. OR
	3. NOT
	4. AND
	
	==========
	1 Mon, 2 Tues, 3 Wed, 4 Thur, 5 Fri, 6 Sat, 7 Sun
	
	IF day >= 1 AND day <= 5 THEN
	SEND "weekday" TO DISPLAY
	ENDIF
	IF day = 6 OR day = 7 THEN
	SEND "weekend" TO DISPLAY
	ENDIF
	IF NOT (day >= 1 AND day <= 7) THEN
	SEND "error" TO DISPLAY
	ENDIF
			4

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(d)</td><td>One mark for each row (maximum 4 marks):

<table>
<tr><td>(1)</td><td>SELECT (id, description)</td><td></td></tr>
<tr><td>(1)</td><td>FROM tblProduct</td><td></td></tr>
<tr><td rowspan="2">(1)</td><td>WHERE id LIKE 'G%'</td><td>Pattern must be discernible as a string (“”), the letter G (g), and a wild card character (*,#,?)</td></tr>
<tr><td>WHERE id>=”G000” AND id <=”G999”</td><td>Pattern must be discernible as a string (“”), the letter G (g), and the operator “AND”</td></tr>
<tr><td>(1)</td><td>ORDER BY id ASC</td><td>Award ASCEND(ING)</td></tr>
</table></td><td>Do not penalise spelling</td><td>4</td></tr>
</table>

(Total for Question 3 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	Any two of: • Both the instructions and data for a program are stored in main memory • Instructions and data are stored in binary code • Instructions and data are fetched, decoded, and executed in a sequence by the CPU		**2**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	One mark for: • Software (layer) One mark for any of: • Allows the operating system on one physical computer **to simulate another computer**, usually of a different operating system. • Allows a **guest operating system** to reside on a machine • Allows **a program written for one machine to run on another** wit**hout changes (Java Virtual Machine).** • Any other appropriate and correct response.	An example (JVM or Linux on Windows) is not enough for marks	**2**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	At least one from both sections for full marks Any four of: Sequential: • Individual instructions are executed one after another • Flow control is accomplished by jump/branch/goto instructions • Results are usually achieved less quickly than parallel processing (do not award twice) Parallel: • Individual instructions can be routed to different processors for simultaneous execution • Results are usually achieved quicker than sequential instruction (do not award twice) • Requires multi-core processors or multiple microprocessors • Tasks may be split into different parts with each part executed on a different processor • Results need to be merged back together after completion Any other appropriate and correct response.		**4**

Question Number	Answer	Additional Guidance	Mark

4(c)(i)	Coding solution **(one mark for each item):**
	• **Calli**ng code must provide an input parameter
	• `calcCircleArea` signature must take an input parameter
	• Input parameter must be used in calculation
	
	`47`
	`48 calcCircleArea (radiusOfCircle)`
	`49`
	`50 PROCEDURE calcCircleArea (radiusOfCircle)`
	`51 BEGIN PROCEDURE`
	`52 SET area TO Pi * radiusOfCircle * radiusOfCircle`
	`53 SEND area TO DISPLAY`
	`54 END PROCEDURE`
	`55`
		Ignore any reference to data types	**3**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	One mark for each correct cell **Pupil Number Visited** | **Sub-list** 2245 | 837, 1529, 1683 1529 | 1683 1683 |		**5**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>4 (c)(iii)</td><td>One mark for each correct column

<table>
<tr><th>A</th><th>B</th><th>R = A OR B</th><th>S=NOT(A AND B)</th><th>Q=R AND S</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
</table></td><td></td><td>3</td></tr>
</table>

(Total for Question 4 = 19 marks)

Question Number	Answer	Additional Guidance	Mark
5(a)	Characteristics – Any of the following: • Branch of computer science based on enabling computers to behave like humans/mimic aspects of human intelligence • AI is implemented in software. • Combines psychology, biology, linguistics, mathematics, neuroscience, and philosophy (ethics) • AI is not the same as the general intelligence of human beings Uses – Any of the following: • Game playing (chess, quiz, video games) • Analytics (analyse buying patterns, predicting behaviours, predictive text, financial markets) • Image processing (recognising objects/patterns) • Logistics (scheduling, order fulfilment) • Control systems (cars, manufacturing, weapons, navigation) • Expert systems (medical, mechanical, electrical diagnosis) • Neural networks (simulating neuron behaviours as in brains) • Natural languages processing (chatterbots, chatbots, speech recognition) • Robotics (dangerous situations, help aged or disabled) Ethical issues – Any of the following: • Take the work of humans, thereby affecting employment rates • Is a computer to be trusted to make decisions (life-death)?	A bulleted list of facts is only worth 2 marks max.	**6**

	• If a computer discovers something that humans can't prove, should it be accepted as truth? • Do AI machines have rights? • Will people be comfortable interacting with machines that are considered intelligent? Quality of Written Communication: • 1-2: Some basic points from **at least one** of the categories; little clarification or expansion of points; spelling, grammar, and punctuation **errors hinder meaning**. • 3-4: At least one relevant point **from two categories**; some clarification or expansion of points; spelling, grammar, and punctuation **errors occur**, but do not hinder meaning. • 5-6: Relevant points from **three categories**; comprehensive clarification or expansion of points; spelling, grammar, and punctuation are **used accurately** and meaning is clear. **Example:** Robots are machines that use artificial intelligence to do jobs that people tell them to. They are not as smart as real humans. One category only; no expansion; QWC ok; 2 marks max) **Example:** Artificial intelligence is based on getting machines to behave like humans. The cleverness of AI is really in the software. AI is used in game playing. Recently the AI software has beat humans at some games. (Two categories; Some expansion; QWC ok; 4 marks max)		

	Example: AI is a branch of computer science that tries to make software imitate human intelligence. However, we're not there yet. It is used in expert systems to diagnose problems with car engines. It can also be used to predict which products people might buy in a grocery store based on their loyalty card purchases. There are problems with AI. One is the issue of ethics. Courts may decide that AI robots have the same rights as humans. People may not like the idea of computers making life and death decisions, such as when to turn off life support systems. This may make people very uncomfortable. (Three categories; Comprehensive expansion; QWC ok; 6 marks max) **Example**: AI: • Making robots behave like humans Uses: • Used to help people with disabilities live in normal homes Ethical Issues: • They will be taking over human jobs and putting people out of work (Three categories; QWC unmarkable; 2 marks max)		

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(b)(i)</td><td>One mark for initialisation of variables (max 1 mark)
One mark for each complete pass of loop (max 4 marks)

<table>
<tr><th>R3</th><th>R4</th><th>R5</th><th></th></tr>
<tr><td>1</td><td>2</td><td>4</td><td>1 mark</td></tr>
<tr><td>2</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>3</td></tr>
<tr><td>4</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>2</td></tr>
<tr><td>8</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>1</td></tr>
<tr><td>16</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>0</td></tr>
</table>

Other formats for this table are acceptable. For example, each combination of 2 values may be on a single line (indicated in grey).</td><td></td><td>5</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	Calculates the number defined as one of (or equivalent statement) • $R4^{R5}$ • 16 • 2^4 • 2 x 2 x 2 x 2		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	<table><tr><th>Part</th><th>Name</th></tr><tr><td>MOV</td><td>Opcode / operation code field / operation</td></tr><tr><td>R4,#2</td><td>Operand / operand code field / operand field</td></tr></table>	• Do not penalise spelling	**2**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(b)(iv)</td><td>One mark for each of:
• Initialisation (R3, R4, R5)
• Correct loop construction showing blocking
• Correct two lines inside of loop blocking

<table>
<tr><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
WHILE R5 <> 0
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END WHILE</pre></td><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
FOR X FROM 1 TO R5 DO
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END FOR</pre></td></tr>
<tr><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
REPEAT
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
UNTIL R5 = 0</pre></td><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
FOR EACH X FROM R5 DO
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END FOR</pre></td></tr>
</table>
</td><td>• Accept alternate solution of DO/WHILE as long as test is “R5 <> 0”
• Do not penalise pseudocode usage as long as response is blocked and discernible
• A specific language construct of a while, repeat, or for loop should be awarded if blocked and discernible</td><td>3</td></tr>
</table>

```
SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
REPEAT R5 TIMES
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END REPEAT
```

```
SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
FOR X FROM 1 TO R5 STEP 1 DO
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END FOR
```

Other solutions may be correct, as long as it includes a sensible loop with the correct test for terminating condition.

(Total for Question 5 = 17 marks)

Total for paper = 90 marks

Content Mapping Grid

Question	Specification	Marks
1a(i)	5.1.5	1
1a(ii)	5.2.1	1
1a(iii)	5.2.9	1
1a(iv)	5.1.2	4
1b(i)	3.4.1	1
1b(ii)	3.4.2	2
1c(i)	3.1.4	1
1c(ii)	3.1.5	1
1c(iii)	3.1.5	1
1c(iv)	3.2.4	1
1d(i)	3.3.2	1
1d(ii)	3.3.2	1
1e	2.4.3 1.1.1	2
2a	6.1.3	3
2b(i)	4.5.1	4
2b(ii)	2.1.2	1
2b(iii)	2.2.1	1
2b(iv)	2.2.2	1

Question	Specification	Marks
2b(v)	2.3.5	1
2b(vi)	2.3.5	1
2c(i)	3.1.2	3
2c(ii)	3.3.1	1
2c(iii)	3.3.4	2
3a	4.4.1	3
3b(i)	5.2.4	2
3b(ii)	5.2.3	3
3c(i)	2.6.1	2
3c(ii)	4.3.2	4
3d	3.5.3	4
4a	4.2.2	2
4b(i)	4.1.1	2
4b(ii)	4.1.2	4
4c(i)	2.6.3	3
4c(ii)	1.1.8	5
4c(iii)	4.3.1	3
5a	6.1.1	6

Question	Specification	Marks
5b(i)	2.1.6	5
5b(ii)	1.1.1	1
5b(iii)	4.2.3	2
5b(iv)	2.2.2	3

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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**

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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**

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**

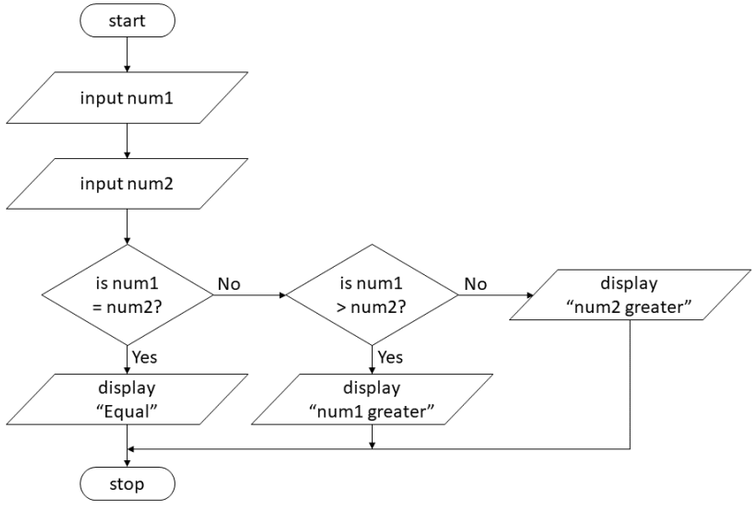
<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(c)</td><td>One mark for each correct row showing relationship of variable changes.
<table>
<tr><th>count</th><th>accept</th><th>reject</th><th>weight</th><th>Display</th></tr>
<tr><td>0</td><td>0</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.

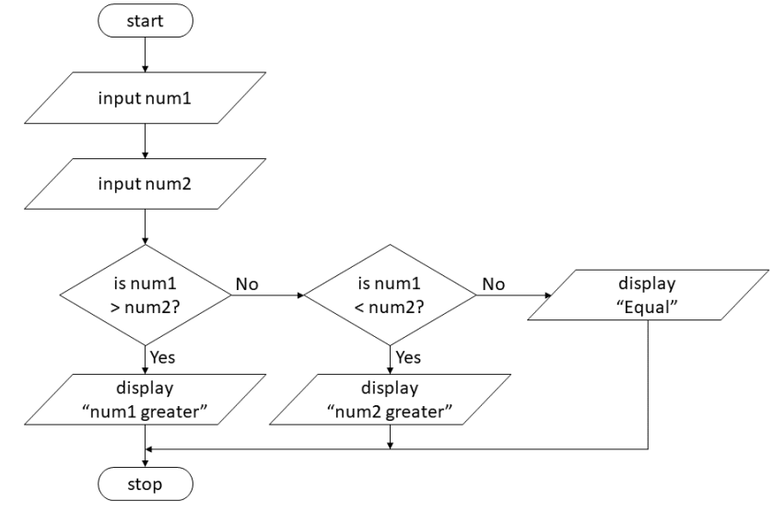
Final ‘3 1’ can be included on row above.

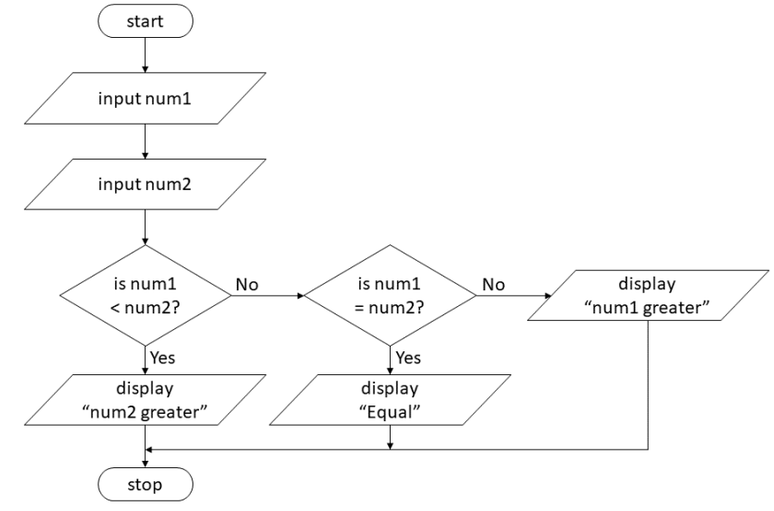
Ignore formatting of 3 1 in Display column (e.g. accept ‘3,1’)

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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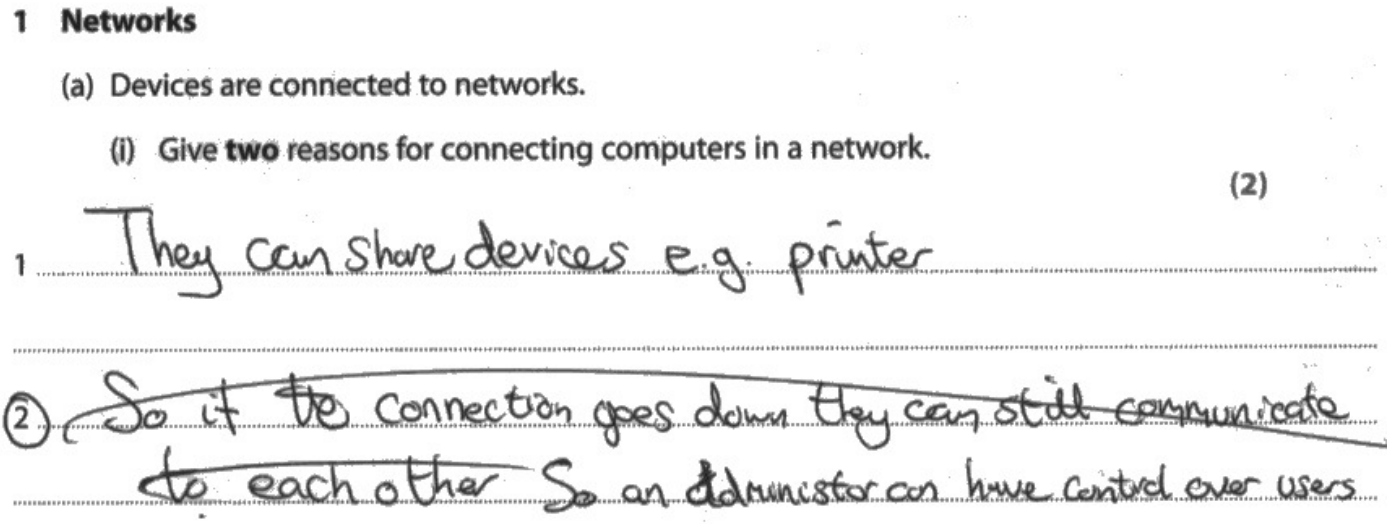
20

1CP2-01

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Question 1 (a)(i)

'Share data', 'communication' and 'share peripherals' were very frequent responses amongst candidates, who answered this question well.



1 Networks

(a) Devices are connected to networks.

(i) Give **two** reasons for connecting computers in a network.

(2)

1 They can share devices e.g. printer

2 So if the connection goes down they can still communicate to each other So an administrator can have control over users

ResultsPlus
Examiner Comments

'Share devices' gained the first mark.

The second mark was given for stating that an administrator can have control over users, as it implies 'central control'.

Total: 2 Marks

1 Networks

(a) Devices are connected to networks.

(i) Give **two** reasons for connecting computers in a network.

(2)

1 faster connection

2 Data is faster shared and saved easily.

ResultsPlus
Examiner Comments

This response implies that data can be shared.

Total: 1 Mark

Question 1 (a)(ii)

Candidates showed an understanding that LANs cover a smaller area than WANs.

It was good to see candidates using network hardware terminology correctly, to differentiate in this question.

(ii) Describe **one** way a local area network (LAN) is different from a wide area network (WAN).

(2)

LAN is only connected to one switch / hub while WAN is a group of LAN connected

ResultsPlus
Examiner Comments

This candidate receives both marks.

Total: 2 Marks

Question 1 (a)(iv)

There was some understanding of the delay between sending and receiving data.

Some responses referred to it linking to a device or network and how dependable that was instead. Quite a few candidates described bandwidth, rather than latency.

(iv) Define the term 'latency'.

(1)

time of Delay.

ResultsPlus
Examiner Comments

There is not enough information here, to justify the mark.

Total: 0 Marks

(iv) Define the term 'latency'.

(1)

The time taken for a network to communicate with a device.

ResultsPlus
Examiner Comments

This response implies that latency is the time taken for data to be sent (communication) between two devices (a single device called 'a device' and an abstraction of many devices called 'a network').

Total: 1 Mark

Question 1 (b)(i)

The majority of candidates gained the mark for this question.

Question 1 (c)

Candidates understood that a firewall monitors traffic, but there was a lack of expansion from this.

Candidates who said it followed a set of protocols/rules often expanded with 'that defines whether the data is allowed into the network or not'.

A few candidates only referred to hacking.

(c) Describe how a firewall protects a local area network (LAN).

(2)

The firewall protects viruses from a LAN. It also protects the LAN from hackers

ResultsPlus Examiner Comments

Some candidates gave general and inaccurate responses.

Total: 0 Marks

(c) Describe how a firewall protects a local area network (LAN).

(2)

Firewalls work as barriers against untrusted networks by monitoring ingoing and outgoing traffic. It also has reference to a set of security guidelines so it can detect and block hostile traffic.

ResultsPlus
Examiner Comments

There was a number of responses where good levels of understanding were evident.

Total: 2 Marks

Question 1 (e)

A few candidates referred to the star network as having a server. Apart from this, the question was answered well.

The majority of candidates mentioned that if the central device/switch/hub failed, then those connected to it would too.

(e) Explain **one** disadvantage of using a star network topology.

(2)

one disadvantage is that the central hub or switch fails, the entire network will fail as the all devices are connected to it.

ResultsPlus
Examiner Comments

A good response that gains both marks.

Total: 2 Marks

(e) Explain **one** disadvantage of using a star network topology.

(2)

When the router is having trouble then this will effect all the devices which are connected to it.

ResultsPlus
Examiner Comments

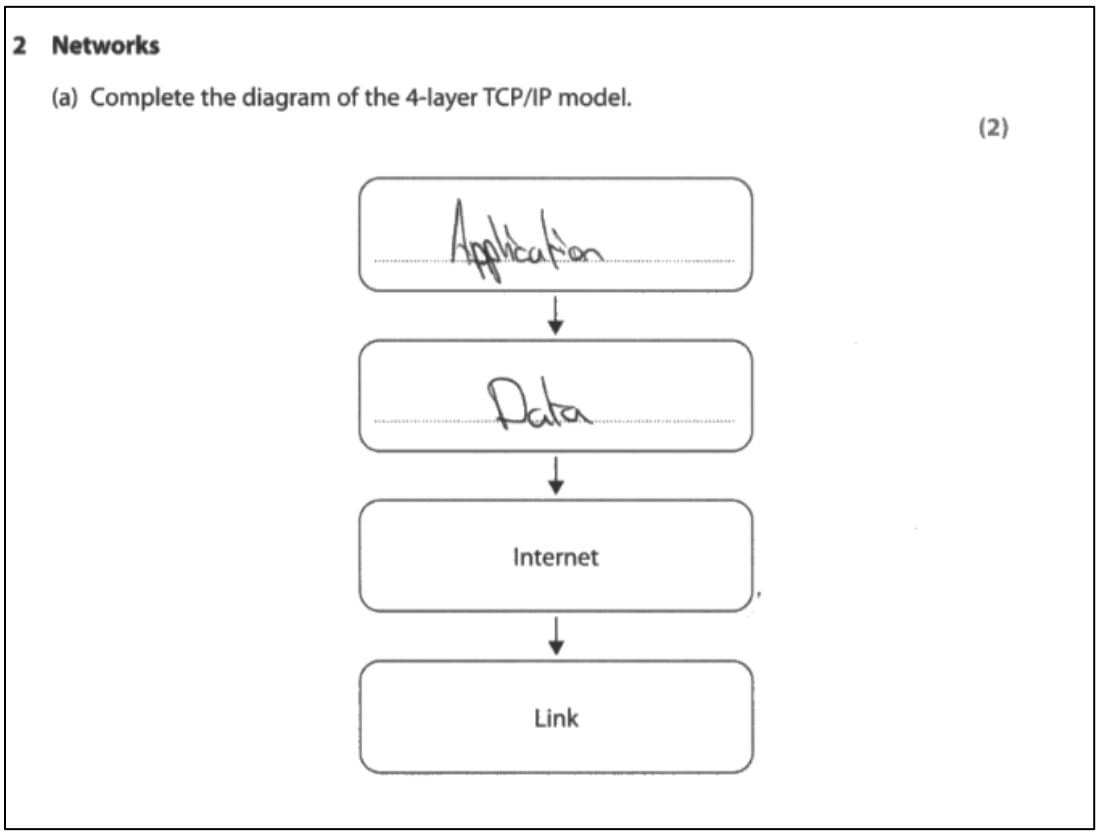
See additional guidance in the Mark Scheme.

The response implies that if the central device fails, all other devices will be affected (infer: negatively).

Total: 2 Marks

Question 2a

Students could either complete the first two layers correctly or not identify either of the layers. There were a wide range of unrelated responses that showed a lack of understanding of the layers.

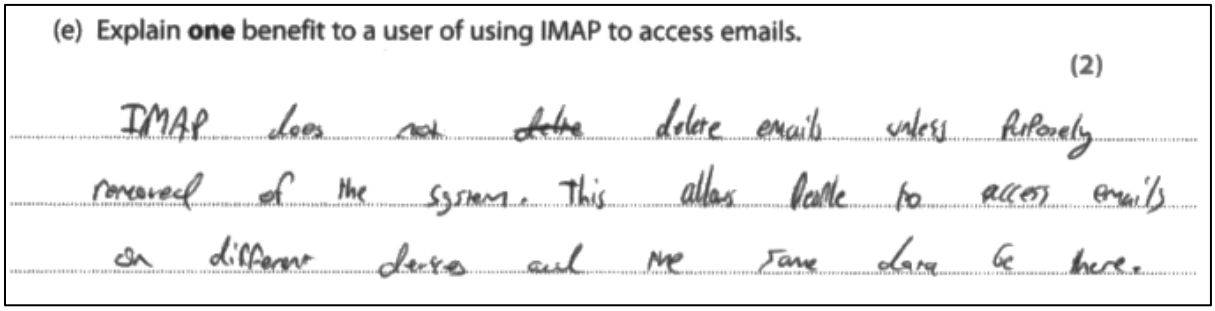

2 **Networks**

(a) Complete the diagram of the 4-layer TCP/IP model.

(2)

This response scored 1 mark for 'Application'.

Many responses stated that IMAP allows emails to be accessed from multiple locations instead of multiple devices, thereby confusing IMAP with networking. A number of responses made reference to speed of access and security, which were not relevant to the question.


(e) Explain **one** benefit to a user of using IMAP to access emails.

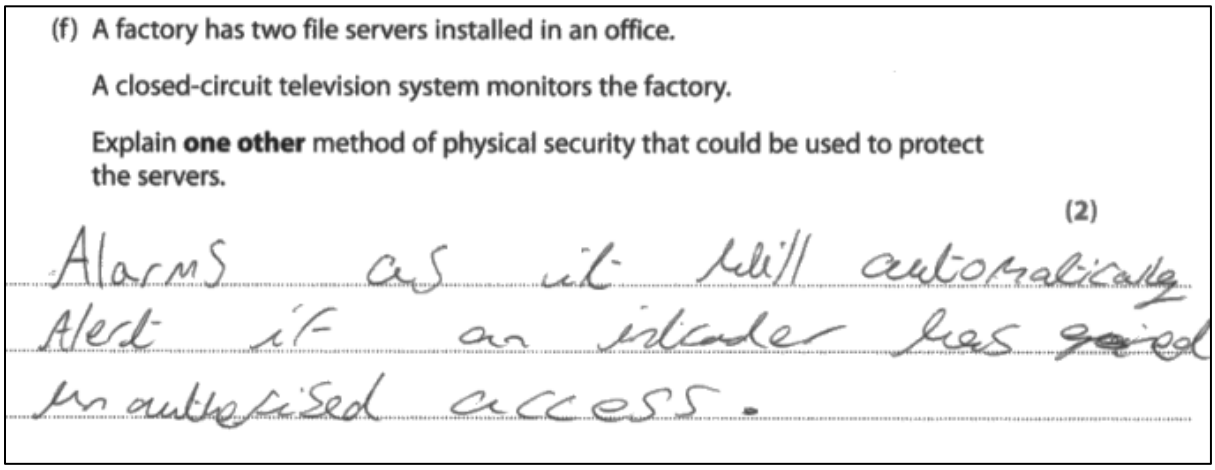
(2)

IMAP does not delete emails unless purposely removed of the system. This allows people to access emails on different devices and the same data be there.

This response scored 2 marks. 1 mark for 'unless purposely removed' and another mark for 'allows people to access emails on different devices'.

Question 2f

Many students highlighted the use of locked doors as a suitable method of physical security. Some referenced CCTV, despite it being in the question. Those who only gained one mark did not make it clear that unauthorised users would be prevented. A few responses mistakenly identified protection such as firewalls, which did not directly address the question's focus on physical security. While their responses demonstrated some knowledge, they needed to be aligned with the specific requirements of the question.


(f) A factory has two file servers installed in an office.

A closed-circuit television system monitors the factory.

Explain **one other** method of physical security that could be used to protect the servers.

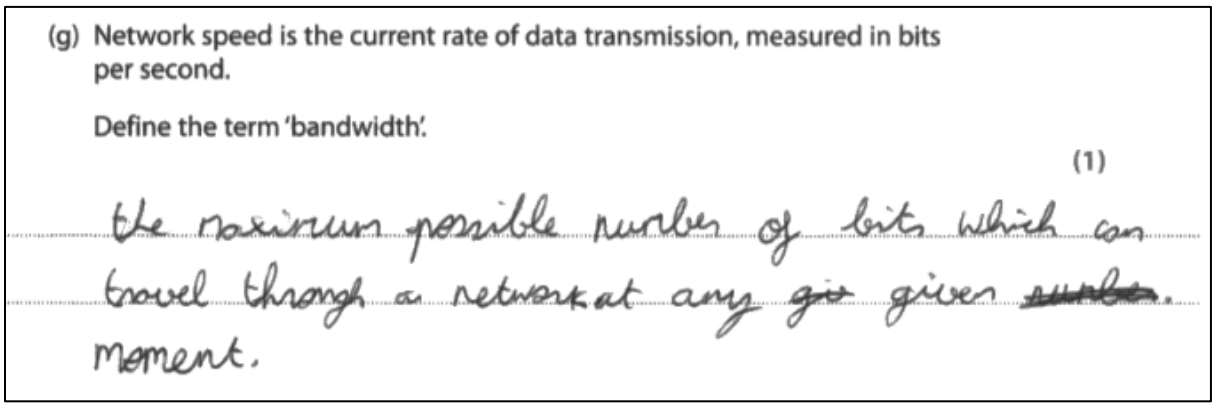
(2)

Alarms as it will automatically Alert if an intruder has gained unauthorised access.

This response scored 2 marks.

Question 2g

Most responses suggested some knowledge of bandwidth, but students did not identify that it is the maximum amount of data that could be transmitted at a given point in time. Most students who did not gain full marks did not refer to maximum data capacity. Some responses referred to 'bandwidth' in terms of distance/range.

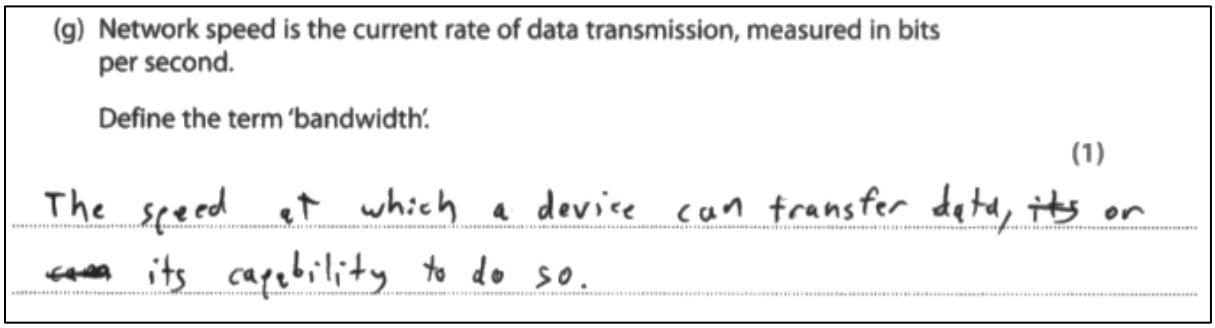

(g) Network speed is the current rate of data transmission, measured in bits per second.

Define the term 'bandwidth'.

(1)

the maximum possible number of bits which can travel through a network at any ~~gi~~ given ~~number~~. moment.

This response scored 1 mark for 'The maximum possible number of bits'.


(g) Network speed is the current rate of data transmission, measured in bits per second.

Define the term 'bandwidth'.

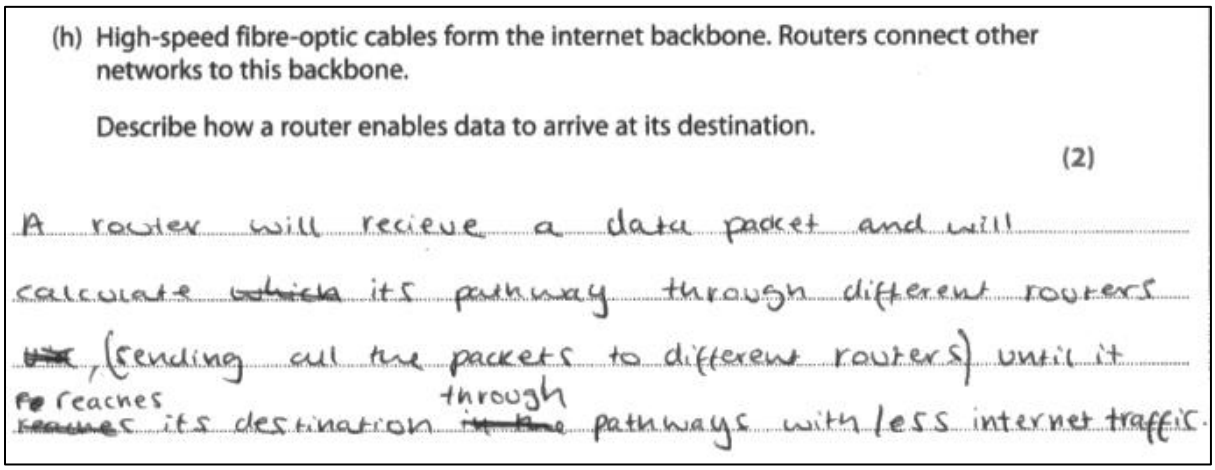
(1)

The speed at which a device can transfer data, ~~its~~ or ~~can~~ its capability to do so.

This response scored 0 marks.

Question 2h

Students often described the process of what happens when data travels through the network but not how (i.e. packet switching). Many were able to identify that the data travelled through the router and concentrated on what it does rather than how it gets there. Many key words were used, including IP address, but MAC was also used in descriptions of the process. At other levels, students had described the packet switching process in detail including checksum processes, clearly showing their level of knowledge and understanding.
There was some evidence that students were recalling a model answer from a similar question on a previous paper.


(h) High-speed fibre-optic cables form the internet backbone. Routers connect other networks to this backbone.

Describe how a router enables data to arrive at its destination.

(2)

A router will recieve a data packet and will calculate ~~which~~ its pathway through different routers ~~the~~ (sending all the packets to different routers) until it reaches ~~reaches~~ its destination ~~through~~ through pathways with less internet traffic.

This response scored 2 marks. 1 mark for 'calculate its (the data packet's) pathway' and the other mark for 'will receive a data packet ... sending all the packets to different routers'. This was enough to imply packets received and then sent **to the next router** (mark point 3). The implication that data is sent to another router was required for this mark point.

Question 3 (a)(i)

The vast majority of candidates were able to correctly identify a Local Area Network (LAN).

Question 3 (a)(ii)

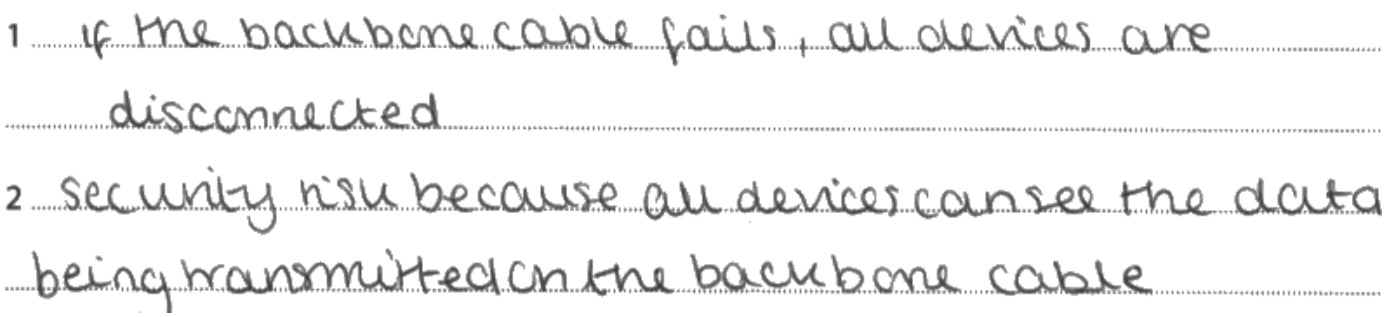
Many candidates struggled to identify that the range that a wireless network covered could be measured in meters. Some candidates confused range with bandwidth.

Question 3 (a)(iii)

The most popular answer was reliance on a common backbone where failure would mean that the whole network would stop working. Some candidates phrased this inaccurately by saying 'if the bus failed' which was not accurate enough, or erroneously thought that if one computer/workstation failed then the whole network would fail. Candidates found it harder to give a second disadvantage.

(iii) Give **two disadvantages** of a bus network topology.

(2)



ResultsPlus
Examiner Comments

This response scores 2 marks for identifying a bus is reliant on the backbone functioning and that there is a greater security risk with a shared cable.

Question 3 (b)

Many candidates had some knowledge of penetration testing but answers were frequently quite vague or limited to 'hacking' without further expansion. Common mistakes included confusion with testing in general, omitting the point that it is an attack that is authorised by the organisation, or did not expand to give the purpose being to find vulnerabilities to fix to improve security.

(b) Describe penetration testing.

(2)

Penetration testing involves purposefully attacking a network to test for vulnerabilities that could be exploited by a hacker / virus or other threat to the security of the network.

ResultsPlus
Examiner Comments

This response scores 2 marks for correctly identifying that penetration testing is used to attack a network to find vulnerabilities.

Question 3 (c)(i)

This question was generally well answered but a number of of candidates gave an example of an application protocol rather than a protocol that is used for transmission.

(c) Network protocols control the rules of communication.

(i) Name a network protocol that transmissions from other electrical devices can interfere with and that can be blocked by walls.

(1)

Wi-Fi

ResultsPlus
Examiner Comments

This response scores 1 mark for naming WiFi.

Question 3 (c)(ii)

Many candidates gave examples of protocols, but few could correctly identify File Transfer Protocol (FTP) as the protocol that would be used to download a file. The question was clear in terms of specifying a protocol that is used for file transfers such as downloading. Some candidates erroneously gave a music file format such as .mp3 rather than a network protocol.

Question 3 (d)

Candidates found this to be a challenging question, and the link layer appeared to be poorly understood. Some candidates appreciated that WiFi and Ethernet are protocols that are used at the link layer and some could go on to expand as to the types of signal that would be sent. Few candidates discussed MAC addresses and how they are used at the link layer. Many candidates confused the link layer with the network layer and IP addressing.

(d) Describe how the link layer of the TCP/IP protocol stack works.



(2)

The link layer uses either Ethernet or Wi-Fi to ~~et~~ send data from one device to ~~et~~ another, using its IP address and data packets

ResultsPlus
Examiner Comments

This response scores 1 mark for identifying that the Wi-Fi or Ethernet protocol can be used by the link layer.

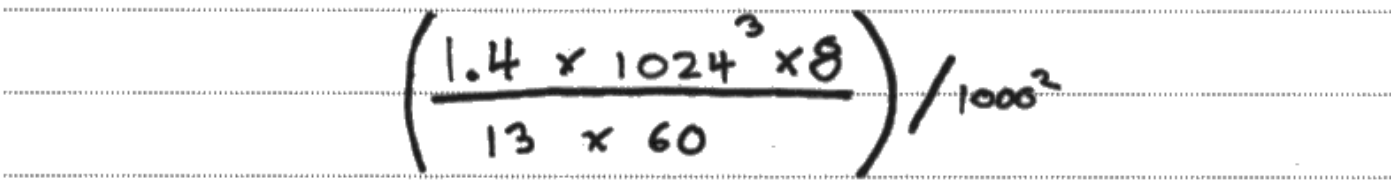
Question 3 (e)

Many candidates gained at least 1 or 2 marks, with the most frequent mark being for identifying an expression for the total number of seconds. Some candidates confused SI units (decimal prefixes) with IEC units (binary prefixes). Candidates also struggled to remember that file storage size is in bytes and that transmission speeds are measured in bits, so a conversion factor of 8 is also required.

(e) Construct an expression to calculate the transmission rate, in megabits per second, required to transmit a 1.4 gibibyte file in 13 minutes.

You do not need to do the calculation.

(4)



(Total for Question 3 = 14 marks)

ResultsPlus
Examiner Comments

This response scores full marks. It identifies 13x60 for the number of seconds, $1.4x8x1024^3$ for the total number of bits to transfer and 1000^2 for the number of bits in a megabit. Each component is then combined to construct a fully correct expression.