Chhetri Academy

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GCSE COMPUTER SCIENCE

1.3

OCR J277 | Specification point 1.3.2

Wired and wireless networks, protocols and layers

Untiered

Answers and examiner comments

8	2018-2025	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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>1 mark for LAN
1 mark per bullet for justification to max 2
• Small distance/geographical area by example e.g. same building/house
• Connected by own hardware/infrastructure // not connecting through Internet // no hired/third-party infrastructure // dedicated connection</td><td>3
AO2 1a (2)
AO2 1b (1)</td><td>Do not allow – in a local area, local needs to be quantified in some way.

No marks for WAN.</td></tr>
<tr><td>2</td><td>(b)</td><td></td><td>1 mark per row
<table><tr><th>Description</th><th>Ethernet</th><th>Wifi</th></tr><tr><td>A wired connection</td><td>✓</td><td></td></tr><tr><td>More likely to be affected by interference</td><td></td><td>✓</td></tr><tr><td>Data can be transmitted at a faster speed</td><td>✓</td><td></td></tr><tr><td>Wireless transmission</td><td></td><td>✓</td></tr><tr><td>Shorter transmission range before data is lost</td><td></td><td>✓</td></tr></table></td><td>5
AO1 1a (5)</td><td>0 mark for row with >1 tick</td></tr>
<tr><td>2</td><td>(c)</td><td>i</td><td>1 mark per bullet to max 2
• Directs packets/data to destination // directs packets/data in a network
• Receives packets/data from the network/Internet
• Forwards packets/data to other computers on the network/Internet
• Connects (different) networks together // e.g. joins home network to Internet
• Has (public) IP address for LAN
• Designates (private) IP addresses to network nodes</td><td>2
AO1 1a (1)
AO1 1b (1)</td><td>Controls flow of data as BOD for bullet 1.

Bullet 1 needs to refer to the router directing the destination e.g. it is making a decision/choice on where to send it.

Bullet 4 - it has to be referring to the connection between the Internet and home network, or forwarding of data between them. Just referring to accessing Internet is not enough.

Do not allow information for data/packets</td></tr>
</table>

J276/01 Mark Scheme June 2018

Question			Answer	Mark	Guidance
2	(c)	ii	1 mark per item to max 2 e.g. • Network Interface card / NIC • Wireless access point / WAP • Wireless network interface card / WNIC / wi-fi card • Bridge • Switch • Hub • Repeater // wireless extender/booster • Server	2 AO1 1a (2)	Accept modem, power line adapter, Ethernet **jack** Must be an item of network hardware
2	(d)	i	Domain Name Server // DNS.	1 AO1 1a (1)	Allow Server/service/system
2	(d)	ii	1 mark for each letter in the correct place 1 The request is put into packets 2 **E** 3 The packets are sent across the network 4 **D** 5 **A** 6 If they have not arrived: 7 A timeout is sent to request the packets are resent 8 If they have arrived: 9 **B** 10 **C**	5 AO1 1b (5)	

Question			Answer	Mark	Guidance
2	(e)		1 mark for naming threat, 1 for description, 1 for prevention. Max 3 per threat e.g. • Virus / trojan / worm / malware • Piece of software/code/a program that replicates itself // causes damage e.g. editing/deleting files • Running anti-virus/anti-malware software // don't download from unknown sources // don't click on unknown links • Spyware / malware / keylogger • Piece of software/code/a program that records actions/key presses and sends this data to a third party for analysis • Running anti-spyware/anti-malware software/firewall • Data interception / passive • Data is sent to another device and is intercepted by a third party • Encryption • Phishing • An e-mail has a link that when clicked directs the user to a fake website that collects personal data • Network policy // firewall • Pharming • A piece of code installed that redirects user to fake website that collects personal data • Anti-malware // firewall • Hacker • Person attempting to gain **unauthorised** access to the network/computers/ data/files // **unauthorised** access and then deleting/editing data/files	9 AO1 1b (3) AO2 1a (3) AO2 1b (3)	Must be relevant to home use i.e. not denial of service, SQL injection. Do not allow adware, spam. Do not allow backup as a prevention – it does not prevent the threat occurring. Do not allow encryption for stopping a hacker. Description must do more than repeat the threat. Read whole response to threat, identify threat first (may not be at the start and may be within description), then look for description. If no threat identified, then no mark for prevention. Allow any example of hacking for hacker e.g. cracking (password), active. But only once. Only award malware once, for virus or spyware e.g. virus identified, then malware identified both can be awarded. Virus, then malware, then spyware, would get a repeat for final spyware. Allow: • Ransomware • Prevents access to your files unless a ransom is paid • Anti-virus/firewall

J276/01 Mark Scheme June 2018

Question			Answer	Mark	Guidance
			• Firewall // strong password // biometrics // penetration testing • Brute force attack • Person/software using every combination of passwords to gain access • Firewall//strong passwords • Social engineering • Person being the weak point of the system // by example e.g. any example of deception • e.g. Strong passwords // check validity of sources		

Question			Answer	Mark	Guidance
3*			**Mark Band 3–High Level** **(6-8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material	8 AO2 1a (4) AO2 1b (4)	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: **Indicative Content:** <u>Inhabitants</u> • Connection with the rest of the world • Access to more information • Up-to-date with news • E-commerce • Communication with people • Can be used in schools/for education • Cost (Devices and connection) <u>Businesses</u> • Sell products to wider audience//more customers • Purchase items from wider range/more places • Competitive prices • Tourism can be advertised • Online bookings for hotels <u>Ethical issues</u> • Access to inappropriate/illegal content • Lead to social pressure to be online and get technology • Cost • Introduces digital and social divide • Threats <u>Privacy issues</u> • Tracking of IPs/devices • Social media

Question			Answer	Mark	Guidance
			is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No attempt to answer the question or response is not worthy of credit		• Unwanted images and videos of people may be put online • Risk of threats e.g. phishing/pharming/virus

Question			Answer	Mark	Guidance
5	(a)		• An agreement / set of rules / standard • …for how computers should communicate // how data is sent/received/transmitted on a network • Example of what could be agreed in the protocol (e.g. speed / error checking / etc.)	2 AO2 1b (2)	Do not award set of instructions for bullet 1
5	(b)	(i)	1 mark for protocol, 1 mark for description • FTP / file transfer protocol • Uses a client-server model // sends from client to server // sends from server to client	2 AO2 1b (2)	If protocol wrong, no mark for description
5	(b)	(ii)	1 mark for protocol, 1 mark for description e.g. • HTTPS / hyper text transfer protocol secure • **Encrypts** the connection/data // Uses SSL/secure socket layer	2 AO2 1b (2)	If protocol wrong, no mark for description
5	(c)		1 mark for IMAP, 1 mark for SMTP. IMAP • Retrieves/accesses/downloads (a copy of an) e-mail • Allows synchronisation/management of account SMTP: • Sends/forwards/transmits e-mail	2 AO1 1b (2)	Marks are for IMAP retrieving, SMTP sending. At this stage do not worry about where they are going. Question does not refer to email, so response must in some way refer to email/message. Sends/receives data is not enough.

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Original question 5

The full source mark scheme begins on page 23. Use the original paper code, tier and question number shown above.

Original question 7

The full source mark scheme begins on page 45. Use the original paper code, tier and question number shown above.

Question			Answer	Mark	Guidance

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

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

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

3	**(e)**		1 mark each to max 2 e.g. • Data cannot be **understood** if intercepted // The data will be meaningless • So that only authorised users can access the **confidential** material // protect **confidential/personal/user/library** data • To follow legislation/DPA	2	Question is transmission not storage Candidates might answer in terms of why encryption is good, or why the current system is not good. If the candidate has not clearly said which they are talking about (e.g. the current system ….. or encryption means ….) then the reverse of each mark point can be given.
3	**(f)**		1 mark each e.g. Send email: **SMTP** // simple mail transfer protocol Access website securely: **HTTPS** // hypertext transfer protocol secure	2	Mark first answer in each line. If abbreviation is inaccurate, check if written out (and vice-versa).
4			**Mark Band 3–High Level** **(6-8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in	8 AO2 1a (4) AO2 1b (4)	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: **Indicative Content:** Legal issues: • Copyright designs and patents act - can check for plagiarism automatically and highlight posts e.g. videos or images • Data protection act - needs to make sure rules are followed so that the AI algorithm does not breach e.g. security • Check that materials are all legal • User has agreed the terms when signing up so should expect it Ethical issues: • Users may not want everything they post monitoring • May incorrectly block users/posts

			relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No attempt to answer the question or response is not worthy of credit		• Can limit plagiarism • Can make sure inappropriate/illegal posts are not published • Website will need to tell users what it is doing and they must agree with it • Record of monitoring reports may be stored and used for other means • Users may feel safer using the website because they know inappropriate material will not be published Privacy issues: • Users may feel like they are being watched all the time • Terms and conditions may sign away their rights to privacy when using the website • People may prefer a computer analysing their posts than people reading them

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>a</td><td>i</td><td>1 mark for each protocol

<table><tr><th>Task</th><th>Protocol</th></tr><tr><td>Requesting a webpage from a web server</td><td>HTTP // HTTPS</td></tr><tr><td>Entering a username and password to access their bank account</td><td>HTTPS</td></tr><tr><td>Downloading a text document from a web server</td><td>FTP // HTTP // HTTPS</td></tr><tr><td>Checking for new emails in their inbox</td><td>IMAP // POP</td></tr></table></td><td>4</td><td>Mark first answer in each box.

Allow full name to be written e.g. file transfer (protocol).

Accept POP3 or any other version</td></tr>
<tr><td>2</td><td>a</td><td>ii</td><td>1 mark each to max 2:
• Each layer is independent // layers are not reliant on other layers
• One layer can be changed without affecting the others // a layer can function without needing/changing/impacting any other layer // self-contained
• Separates tasks so they can be developed independently
• A developer can focus on only one layer // developer can specialise
• Allows for standards for individual tasks/layers to be developed // for compatibility
• Manufacturers can develop hardware to fit into one particular layer
• To group together similar protocols</td><td>2</td><td>Max 1 in each answer space</td></tr>
<tr><td>2</td><td>b</td><td>i</td><td>1 mark from:
• Uses dedicated/own/internal hardware
// no external/third party hardware/infrastructure
// computers use MAC addresses to communicate within the LAN</td><td>1</td><td></td></tr>
</table>

2	**b**	**ii**	1 mark each to max 4: e.g. • Allows **more** devices to connect … • …for example televisions, mobile phones • Easy to connect (devices) // Easier to setup (wireless connections) // By example e.g. easier for guests to connect their devices • Home is likely small area • … so short distance wireless is sufficient • Devices can move around // can use devices in different areas // can connect from anywhere in the house // can use where wires don't reach // can access from a larger area (than wired) • … by example e.g. student is using a laptop so does not need to be tied to one place // by example e.g. they don't have to disconnect before moving // e.g. they can stay connected whilst moving • Cheaper to **purchase**/**install**/**setup** for new devices // no cost for (new/replacement) wires/hardware • …because no **additional**/**fewer** wires are needed • Fewer trip hazards from trailing wires // reduce risk of damage to cables // fewer cables to damage • More compatible // some devices only have wireless connections	4	Easier/cheaper on their own is NE
2	**b**	**iii**	1 mark each to max 2: e.g. • Prone to interference // by example • Limited range of signal • Slower rate of transmission // less bandwidth // reduced network performance// increased latency // BOD slower connection // more users reduces rate of transmission / bandwidth /performance etc. • Increased risk of **security** concerns // by example e.g. A hacker could connect to the wireless connection • Less stable connection • Higher chance of collisions // Higher error rate	2	MP3 needs to say what is slower / decreased e.g. It's slower, is NE Mark first drawback in each answer space. Less reliable is TV on its own for MP 5

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

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

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

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

Original question 4

The full source mark scheme begins on page 60. Use the original paper code, tier and question number shown above.

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Computer Science

J276/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2019

PMT

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

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

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

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J276/01 Mark Scheme June 2019

Annotations

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

PMT

J276/01 Mark Scheme June 2019

Subject Specific Marking Instructions

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

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

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

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

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

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

PMT

J276/01 Mark Scheme June 2019

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

PMT

J276/01 Mark Scheme June 2019

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

PMT

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

J276/01 Mark Scheme June 2019

<table>
<tr>
<td>1</td><td>b</td><td>i</td>
<td>1 mark for each row
<table>
<tr><th></th><th>RAM</th><th>ROM</th></tr>
<tr><td>Stores data</td><td>✓</td><td>✓</td></tr>
<tr><td>The memory is volatile</td><td>✓</td><td></td></tr>
<tr><td>Data will not be lost when the computer is turned off</td><td></td><td>✓</td></tr>
<tr><td>Data is read-only, cannot be changed.</td><td></td><td>✓</td></tr>
<tr><td>Stores currently running data and instructions</td><td>✓</td><td></td></tr>
</table>
</td>
<td>5
AO1 1a (5)</td>
<td></td>
</tr>
<tr>
<td>1</td><td>b</td><td>ii</td>
<td>1 mark
• RAM is volatile // Flash memory is non-volatile
• RAM is faster to access/store data than Flash memory // Flash memory is slower to access/store data than RAM
• RAM stores currently running programs/instructions/data/OS // Flash memory stores files and software
• RAM can be directly accessed by CPU // Flash data has to go to RAM before CPU</td>
<td>1
AO2 1a (1)</td>
<td>• Accept description of volatile/non-volatile
• Bod - RAM is primary // Flash is secondary</td>
</tr>
<tr>
<td>1</td><td>c</td><td>i</td>
<td>1 mark for any suitable example
e.g.
Solid state drive // SSD // flash drive
USB memory stick // USB drive
Memory card // SD card</td>
<td>1
AO1 1b (1)</td>
<td>• USB on its own is incorrect.
• Accept USB stick // memory stick
• Do not accept Hard drive, bod solid state hard drive</td>
</tr>
</table>

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

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

PMT

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

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

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

J276/01			Mark Scheme		June 2019
3	a	i	1 mark per bullet to max 3 e.g. • Malware could be put on the computer • Data protection legislation states personal data must be protected / breaks Data protection legislation • … breach of privacy • …he could lose his job • Delete files // change data • … so the important work is lost/changed • Steal files/data/information // copy data/files/information // keylogger transmits data/files/information to third party • … use for illegal activities • … e.g. profit from the data // gain private information // leak information to the public • Data could be locked	3 AO2 1b (3)	
3	a	ii	1 mark for naming, 1 for description to max 2 per method e.g. • Password • No access without the password // **description** of strong password // limit attempts to guess // changing it regularly • Limited attempts to get into laptop • before laptop is locked • Firewall • Monitor incoming and outgoing transmissions // Stop unauthorised/unwanted incoming/outgoing transmissions/packets. • Biometrics • Need fingerprint/retina scan • Do not leave laptop logged on/unattended • So that other people cannot physical access it • Physical security // keep in locked room • So that people cannot physically access the laptop	4 AO1 1a (2) AO2 1a (2)	• Do not accept encryption/anti-malware, this will not prevent unauthorised access. • Do not accept penetration testing - it's a laptop, not a network. • Login is NE for password • Do not accept access rights - it's access to the laptop

			• Do not connect laptop to network // standalone computer • So that there are no network threats • Two-step verification // two-factor authentication • For example sending code to mobile phone		
3	b	i	1 mark per bullet to max 2 • Uses an algorithm to • … jumble/scramble/mix up the data // turns it into cypher text // by example • If it is accessed it cannot be **understood** // it is **unintelligible** • Use of keys to encrypt/decrypt data	2 AO1 1a (1) AO2 1b (1)	• 'Need the key to understand the data' can get both MP2 and 3 • Cannot read the data // data is unreadable is NBOD

3	b	ii	1 mark for each completed piece of code
			
			`message = input("Please enter your string")`
			`newMessage = ""`
			`messageLength = message.length`
			`for count = 0 to` **`messageLength - 1//`**
			`message.length - 1`
			`  ASCIIValue = ASC(message.subString(`**`count`**`,1)`
			`  ASCIIValue = ASCIIValue +` **`1`**
			`  if ASCIIValue > 90 then`
			`  ASCIIValue =` **`ASCIIValue`** `- 26`
			`  endif`
			`  newMessage =` **`newMessage`** `& CHR(ASCIIValue)`
			`next count`
				5
				AO3 2b (5)
					• For `messageLength - 1` in loop accept `messageLength` or `message.length`
					
					• Spelling must be exact, do not penalise case.

PMT

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

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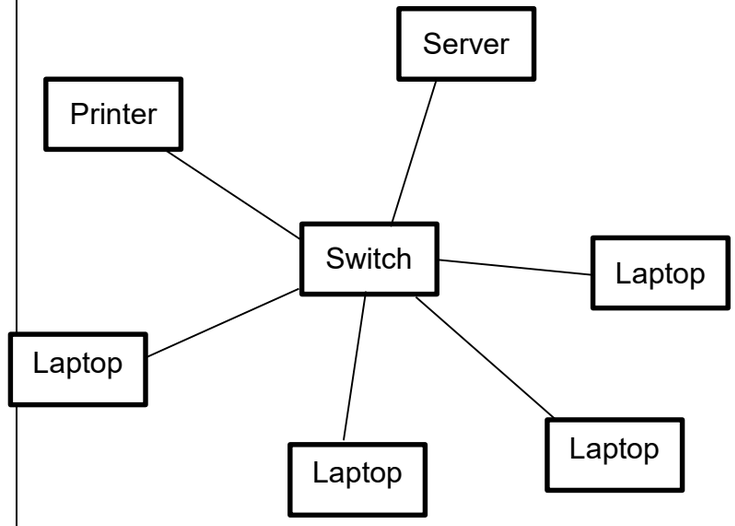
4	a	i	1 mark per bullet • Four laptops/computers, a server and printer present and clearly identifiable (positions do not matter) • Switch as a device clearly identifiable… • …all devices directly connected to the switch and only the switch (FT from MP2) e.g.  	3 AO2 1a (3)	• Printer may be connected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

PMT

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

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

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

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

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

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

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

PMT

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

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

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

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Annotations

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

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Subject Specific Marking Instructions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

J276/01 Mark Scheme November 2021

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

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

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Cambridge Assessment

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GCSE

Computer Science

J277/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2025

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

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

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

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

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

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J277/01 Mark Scheme June 2025

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM Assessor messaging system, or by email.

5. **Crossed Out Responses**
   Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

   Rubric Error Responses – Optional Questions
   Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add a tick to confirm that the work has been seen.

7. There is a NR (**No Response**) option. Award NR (No Response):

   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
   - OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
   If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.

9. *Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.*

10. For answers marked by levels of response: Not applicable in F501
    a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
    b. **To determine the mark within the level**, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

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11. **Annotations**

Annotation	Meaning
A	Omission mark
BOD	Benefit of doubt (must be accompanied with a tick)
	Cross
FT	Follow through (must be accompanied with a tick)
NAQ	Not answered question
NBOD	Benefit of doubt not given
REP	Repeat
	Tick
TV	Too vague
SEEN	Blank pages, pages with no annotation, no attempt to answer the question, page seen on QER
L1	QER Level 1 mark awarded
L2	QER Level 2 mark awarded
L3	QER Level 3 mark awarded

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12. Subject Specific Marking Instructions
Mark scheme conventions:

- Each mark point is worth 1 mark unless stated otherwise
- Each mark point can only be awarded once
- A word/phrase that is underlined needs to be exact in the answer to award the mark point
- A word/phrase that is **bold** needs that concept to be in the answer (but can be given in multiple ways) to award the mark point
- 3 dots at the end of one mark point and at the start of the next mark point mean that the second mark point cannot be awarded without the first being awarded, unless the mark scheme states otherwise (for example a reasonable attempt with some inaccuracies)
- 3 dots at the start of a mark point, without 3 dots at the end of the mark point above, means the sentence carries on and there is no dependency
- Any text in brackets is not required to gain the mark point
- Single / means alternative word
- Double // means an alternative statement that is acceptable for the same mark point
- Enlarged font is used for visibility reasons only

Annotating scripts:

- Blank pages at the start of the script need SEEN annotation
- Any questions answered elsewhere (e.g. on the first blank pages, separately on the page) need to be linked within RM Assessor and annotated with ticks/crosses/SEEN as appropriate
- 1 tick for every mark awarded, if a question is given 3 marks there must be 3 ticks (apart from QER question)
- A BOD or FT annotation needs to be accompanied by a tick
- QER question 3 – One annotation from: L1, L2 or L3, according to the level awarded, the page not annotated with the level needs a SEEN annotation. Do not include any ticks, crosses or other annotations on this question – other than SEEN and one from: L1, L2 or L3
- Any answers with no candidate response need a SEEN annotation and NR entered as the mark.
- Any questions where the candidate has not attempted the question e.g. answered 'don't know' need a SEEN annotation and NR entered as the mark.
- All questions must be annotated throughout the marking process.

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

PMT

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

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>1 mark for each row to max 5

<table>
<tr><th>Operating system function</th><th>Memory management</th><th>Peripheral management</th><th>User management</th><th>File management</th></tr>
<tr><td>Multitasking</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Renaming a folder</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>Creation of user accounts</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>Installation of a printer driver</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>Transfer of data to and from RAM</td><td>✓</td><td></td><td></td><td></td></tr>
</table></td><td>5</td><td></td></tr>
<tr><td>2</td><td>(b)</td><td>(i)</td><td>1 mark from
• Perform housekeeping tasks
• Perform maintenance // Keep the computer running smoothly // identify/fix errors // improve performance of computer
• To monitor / manage / configure a computer system</td><td>1</td><td>Do not accept a specific example of utility software.

Do not accept a task performed by one example of utility software.

Read whole answer and award a correct statement.</td></tr>
<tr><td>2</td><td>(b)</td><td>(ii)</td><td>1 mark each
• Jumble / mix-up / encode / scramble / cypher data
• Encrypt / decrypt using an algorithm / key
• Make it meaningless (if intercepted / unauthorised access) // it cannot be understood / used (if intercepted / unauthorised access)</td><td>3</td><td>MP3 do not accept it cannot be ‘read’ or ‘accessed’.</td></tr>
</table>

3			**Mark Band 3–High Level** **(6-8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* Includes benefits and drawbacks. At least one ethical and at least one environmental issue. References both customer and company clearly for top of band. Points are expanded. **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* Covers benefits or drawbacks to achieve band, top of band requires at least one of each. Covers ethical and/or environmental. Some points are expanded. May only reference customer or company. **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* Has a point for ethical/environmental/benefit/drawback, not all relevant. May not reference customer or company. **0 marks**	8	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: **Indicative Content:** Ethical issues: • Will cost remain the same? – unfair on customers • Will customers be told? Or are they being deceived? • Can improve profit for company – allow staff to be paid more • Ethical to the company but unethical to the customers • Reduced cost may mean reduced reputation- long term loss If people move to other companies • Customers want most up-to-date devices – prepared to spend regularly • Lower cost to purchase may allow more people to afford device Environmental issues • Increase in e-waste from products that are disposed

			• No attempt to answer the question or response is not worthy of credit		• Older devices could be distributed to people without devices to reduce waste • Products could be recycled for components Benefits and drawbacks: • Company Increase sales Increase profit Decrease popularity/reputation • Customer Increase in cost May be able to buy when couldn't before if initial cost is less Less reliable devices Effort/time to install new devices more regularly
4	**(a)**		1 mark each to max 2 • Small geographical location // single building • No use of external infrastructure // All hardware will be owned/managed by youth centre • Dedicated hardware // The hardware is not shared/used by anyone else/any other business • It is **not connecting networks** (like a WAN does)	2	Mark any two correct points as long as not contradicted.
4	**(b)**	**(i)**	1 mark each to max 2 • (Partial mesh) means all devices are connected to one or more devices // (Full mesh) means all devices are connected to every other device • No need for **central** management / switch / device / node // All devices are **equal** // **Decentralised** • Multiple routes/paths (between devices)	2	MP1 BOD each device is connected to other devices // all devices are connected MP2 do not accept no central **server**

4	**(b)**	**(ii)**	1 mark each to max 2 for drawback max 2 for benefit e.g. Benefits: • No **purchase/cost** of central switch / device • … lower cost to install/maintain network // no need to setup / connect to the central device • More connections/paths between devices // alternate routes • … no single point of failure // if a connection breaks can still connect • … more robust structure • More scalable // can have more devices/connections/nodes/computers • … easier to add devices • … can add / remove nodes without impacting other nodes/speed • Decrease in latency • … fewer collisions • Can be setup over a larger area // can provide a more stable connection • … each device acts as repeater Drawbacks: • Large number of / more **connections/wires** • … can involve redundant connections • … this is impractical • Reduced central management/control/oversight of the network/transmission • … less **control** over transfer/security of the network • Less secure BOD example less secure • … more routes/points/devices for data **interception/attack/unauthorised access** • Difficult to find an error • … because of the multiple routes where an error could occur • Mesh network uses more power • … more nodes are involved in each transmission	4	1 mark for a point 1 for expansion/reason/benefit. Any of the MPs can be the benefit/drawback and can be the expansion as long as they follow on. Do not accept faster/slower transmission speeds – dependent on media and many other factors. MP3 and MP4 can be in a single statement e.g. 'If one connection breaks the nodes can still connect through another route'

<table>
<tr>
<td>4</td><td>(c)</td><td>(i)</td>
<td>1 mark each to max 3 e.g.
• Easier to add more devices/users
• Can have more devices/connections/users // more scalable
• … without cost of purchase/install additional wired connections
• Devices are not fixed to one spot // devices can be moved // can connect from anywhere in (wireless) range
• …allowing people to use them where they are needed // can use where there is no physical connection
• Reduces risk of (additional) trailing wires
• Less potential damage to equipment/wires
• Connect wider range / more types of device // by example e.g. mobile phones/tablets
• … that don’t have ports / wired connections // that only have wireless connections
• It allows a backup network if the wired network fails
• (Due to each node acting as a repeater in the mesh) the network will have a greater range</td>
<td>3</td>
<td>MP1 is for easier to add more devices to the network.
MP2 is there can be more connections/nodes/devices than on a wired.
‘more devices can be added easily’ is MP1 on its own.</td>
</tr>
<tr>
<td>4</td><td>(c)</td><td>(ii)</td>
<td>1 mark per bullet to max 2 for each factor
<table>
<tr><th>Factor</th><th>How it affects the performance</th></tr>
<tr><td>Bandwidth</td><td>• More bandwidth = faster network/transmission BOD better performance
• …because more data is transferred simultaneously/per second</td></tr>
<tr><td>Number of users accessing the network at the same time</td><td>• More users = slower network/transmission BOD worse performance
• …because more data is transferred simultaneously // more traffic // the bandwidth is being shared/used // more bandwidth used // BOD more congestion / collisions</td></tr>
</table>
</td>
<td>4</td>
<td>Allow reverse of each.

Do not award references to Internet speed alone.

Points need to reference more/less data in correct context.</td>
</tr>
</table>

<table>
<tr><td>4</td><td>(d)</td><td></td><td>1 mark each to max 5 e.g.
Can be expensive for large amounts of data / long term / hosting // may be ongoing subscription // no control over changing costs
May be limited amount of storage
No control over security // Need to rely on provider for security
May be hacked/stolen/intercepted/affected by a virus
May lose (personal) data // May lose access to data
May go against DPA/legislation // Data may be misused (by provider)
May not be clear where in the world the data is stored
Limited/No control over access
Company/cloud could go down
No control over backup // May not have (automatic) backups …
… data is not retrievable
Need internet access // no internet access means no data
… access speed depends on network/connection speed
Concerns over ownership of the data
Need to remember login details // may forget/lose login details
Users may need training</td><td>5</td><td>MP1 needs more than high cost, it needs identification of ongoing, cost for hosting etc.

MP3 just poor/low security is NE

Accept data may be sold as example of misuse.</td></tr>
<tr><td>4</td><td>(e)</td><td>(i)</td><td>1 mark for router/modem</td><td>1</td><td></td></tr>
<tr><td>4</td><td>(e)</td><td>(ii)</td><td>1 mark for each row.

<table><tr><th>IP address</th><th>Valid (✓)</th><th>Invalid (✓)</th></tr><tr><td>192.154.21.2</td><td>✓</td><td></td></tr><tr><td>258.0.0.3</td><td></td><td>✓</td></tr><tr><td>56.1.2.66.1</td><td></td><td>✓</td></tr><tr><td>251.58.3.7</td><td>✓</td><td></td></tr></table></td><td>4</td><td>Do not award rows with 2 ticks.

Allow Xs in place of ticks in either/both columns.</td></tr>
</table>

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4	**(e)**	**(iii)**	1 mark each to max 4 • Browser checks **cache** for matching IP address • URL/domain is sent to DNS • **DNS** looks for URL/domain to find matching IP • …in table/database/files/lists (of URL/domain and IPs) • If not found the request is transferred to higher-level DNS • DNS returns IP address to **computer/browser** • An error is **returned/sent** if the IP address cannot be found	4	MP3 – award for the use of the DNS converting URL to IP MP5 accept another/larger for higher-level MP6 needs to be computer/browser, do not award user on its own.
4	**(f)**		1 mark for legislation Data Protection Act (2018) // DPA // GDPR // Data protection 1 mark each for steps to max 3 e.g. • Identify data protection officer • Keep data secure/safe (from unauthorised access) • ... by example // installing firewall // usernames and passwords // access rights // physical security // encrypt • Do not share/sell (without consent) • Don't store without consent • Only keep relevant data • … do not collect data from users that is not required • Do not store the data for longer than needed • Make sure the data remains accurate / up-to-date • Only use for purpose collected // Data must not be misused • … state purpose for collection • Do not store/share with countries with lower levels of protection • Change/delete data when requested … • … permanently/securely • Provide data for users when they request to see it • Notify individuals of data breaches • Must use data lawfully/fairly • Staff need to be trained in principles	4	If no legislation, wrong legislation, unclear legislation still award up to max 3 marks for description of DPA. Accept answers listing what needs to be done e.g. data must be up-to-date (without the specific step that will be followed to do this)? MP2 is stopping unauthorised access. MP4 is the company actively giving the data willingly to someone else.

PMT

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>1 mark for 2000000MB (last one)</td><td>1</td><td></td></tr>
<tr><td>5</td><td>(b)</td><td></td><td>1 mark for each completed box
<table>
<tr><th>Denary</th><th>8-bit Binary</th><th>2-digit Hexadecimal</th></tr>
<tr><td>38</td><td>00100110</td><td>26</td></tr>
<tr><td>78</td><td>01001110</td><td>4E</td></tr>
<tr><td>156</td><td>10011100</td><td>9C</td></tr>
<tr><td>215</td><td>11010111</td><td>D7</td></tr>
</table></td><td>4</td><td>Correct answers only – binary must be 8 bits.</td></tr>
<tr><td>5</td><td>(c)</td><td></td><td>1 mark for working all 3 carries.
1 mark for binary answer
e.g.
0 1 1 1 0 0 1 1
+ 0 0 1 1 0 1 0 0
1 0 1 0 0 1 1 1
1 1 1</td><td>2</td><td>Do not award conversion to denary as the only working.</td></tr>
<tr><td>5</td><td>(d)</td><td></td><td>1 mark for 00011101 (first one)</td><td>1</td><td></td></tr>
<tr><td>5</td><td>(e)</td><td></td><td>1 mark each
• Left shift
• 3 places</td><td>2</td><td>No marks for contradictions e.g. “shifting to left or right”</td></tr>
</table>

J277/01 Mark Scheme June 2025

Question			Answer	Mark	Guidance
6	(a)		1 mark for any 1 correct binary code 2 marks for all 3 correct binary codes in the correct order with no additional bits / addition 01010000 01001111 01010000	2	BOD 7-bit ASCII codes if correct Accept answer vertically and horizontally
6	(b)		1 mark for benefit • Can represent more/a wider range of characters • Can represent characters from all/many/different languages // by example • Can store emojis 1 mark for drawback • Larger file size // double the file size of ASCII // more data/binary per character // more storage/bits used // requires more/additional processing • Additional characters are not backward compatible to ASCII // some characters will not be recognised when documents are read/opened in computers that only have ASCII	2	Award any correct point in benefit/drawback
6	(c)		1 mark for register with purpose • Program counter // PC **Stores** the **address** of the **current/next** instruction to be fetched // **stores** the **address** of the instruction for the **current/next** FE **cycle** • Memory address register // MAR **Stores** the **address** of the **current/next/required instruction/data** // **stores** the **address** of **data/instruction** about **to be fetched/executed** // **stores** the **address** where **data/instruction** (in MAR) **is going to be stored** // **stores** the **address** of **instruction/data being decoded/executed** • Memory data register // MDR **Stores** the **data/instruction** fetched from memory // **stores data/instruction** to be stored in memory // stores the **data/instruction** located in the **memory** location in the **MAR** • Accumulator // ACC **Stores** the **result** of calculations // **stores data currently** being processed / by example // **stores** the result from the ALU	2	Careful that the purpose is not an action such as fetches, takes, retrieves. Accept “points” to/at in place of stores Accept • Current instruction register//CIR//Instruction register//IR Stores the instruction currently being executed BOD memory buffer register for MDR. Accept memory address, memory data without ‘register’.

PMT

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Question 3 (a) (i)

3 A library has a LAN (Local Area Network).

(a) The LAN allows access by both wired and wireless devices.

Users have reported that the network sometimes runs very slowly.

(i) Explain why the number of devices using the network at the same time can affect the performance of the network.

.....

.....

.....

.....

.....

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

Most candidates took the approach of describing how more devices affected the performance of the network. Candidates could often explain how more devices meant more traffic, which then used up the bandwidth.

Some candidates were able to identify that each device would have less dedicated time. More candidates described the bandwidth as being split and having less of it for each device.

Some responses required more precision. A common response was that the performance would decrease, or the speed would decrease. The question asked why the performance was affected, so stating that it was affected was not enough to answer the question.

Answers such as the network is slower, or the network runs slower do not specify what part of the network – networks contain many components and devices and answers needed to demonstrate and understanding of which part was affected.

Exemplar 1

(i) Explain why the number of devices using the network at the same time can affect the performance of the network.

The more devices connected to a LAN means that the LAN will run slower. This means that the performance will decrease overall on the LAN network.

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

This response states that the LAN will run slower and that the performance will decrease. This is not enough to explain why the performance is affected.

Exemplar 2

The network has a limited amount of bandwidth. ~~If~~ more device Each devices uses some bandwidth. If more devices connect ~~connected~~ to the network each device gets less bandwith and cannot send as much data as is there was less devices.

This candidate has identified that the bandwidth is split between the devices and then expanded this to identify that each device therefore has less bandwidth.

Question 3 (a) (ii)

(ii) Identify **one** other factor that can affect the performance of the network.

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

This question was often answered well. The most common responses were the bandwidth or interference.

Question 3 (b)

(b) Users can access websites from the library computers.

Complete the description of accessing websites using the given list of terms. Not all terms will be used.

0 1 127 128 255 256 Colon

Domain Name Server Embedded systems File server Full stop

Hyphen Internet protocol MAC address Router

Uniform Resource Locator Web server Clients

A website is hosted on a ..... . The computers that access the websites are called ..... .

The user enters the ..... into a web browser. The web browser sends a request to the ..... for the matching IP (Internet Protocol) address. If found the IP address is returned. A request is then sent to this IP address.

An IPv4 address is made of 4 groups of digits. Each group can be between the denary values ..... and ..... . The groups of digits are separated by a ..... .

[7]

Candidates were often able to accurately identify the first four missing terms. Some candidates confused the web server with the domain name server.

Where terms are provided, candidates need to make sure they are using these. For example some candidates stated a website is hosted on a server – which was insufficient to identify a web server because file server was an alternative term they were provided.

Few candidates were able to accurately identify the denary values that can be used in an IPv4 address. 256 was a common error for the highest number, and 1 was also often given as the lowest number.

The answer for the final space was often given as a colon or a hyphen. Few candidates were able to accurately identify the full stop as being the separator.

Question 3 (c)

(c) The wired connection is an Ethernet connection. Ethernet is considered a standard.

Explain why Ethernet is a standard.

.....

.....

.....

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

Many candidates found this question challenging and gave a description of what Ethernet is, or why it is a protocol.

Some candidates explained what a standard is, and some candidates gave the features of Ethernet and why this makes is appropriate as a standard. For the latter the most common responses were that it was reliable and has a fast transmission speed.

Some candidates were able to define a standard in terms of all devices using it, and some described it appropriately as a requirement for compatibility between these devices.

Question 3 (d)

(d) The network has several routers.

Identify **three** tasks carried out by a router.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

This question was challenging for many candidates.

Some candidates described the purpose of the router, in other words- what its purpose is within a network – rather than identifying tasks that it carries out.

The most common correct responses were that the router receives packets from devices and that it sends packets to devices. Some candidates also identified that it sends the packets towards the intended destination i.e. it looks at the destination and does not send to all connected devices.

Exemplar 3

1 Provides a connection to the devices on the network to the internet.

2 provides an IP (Internet protocol) address if requested.

3 Improves performance on devices.

This response has given a generic purpose of a router in their first answer, providing a connection is the purpose and not a specific task it carries out. The second point was rarely given by candidates but is accurate that a router gives devices in its network an IP address.

Question 3 (e)

(e) The library does not use encryption when data is transmitted through the network.

Give **two** reasons why the library should use encryption.

1 .....

.....

2 .....

.....

[2]

Some candidates were able to identify that encryption makes it impossible to understand the data.

Some candidates stated the data could not be read. This was not precise enough. The data can still be intercepted and read but that this data will be meaningless.

Some candidates also appropriate applied their answers to this scenario, identifying that it meant the data the library was transmitting, e.g. personal/sensitive data, could not be stolen or used inappropriately.

Misconception

A common misunderstanding was that encryption stops data being intercepted. The data can still be intercepted, but when opened it will be meaningless.

Question 3 (f)

(f) Protocols are used to transmit data through the network and over the internet.

Identify **one** protocol that can be used to perform each of the following tasks:

Send an email .....

Access a website securely .....

[2]

This question was often answered well. Many candidates correctly identified HTTPs for the second protocol. However, some candidates did miss the required ‘s’ to indicate it was being accessed securely.

Many candidates also correctly identified SMTP for sending an email, although more candidates gave incorrect email protocols such as POP3.

Question 2 (a) (i)

2 A student is performing a range of actions on the internet using their computer.

(a) A range of protocols are used for the transmission of data by the student's computer, and the web servers they are accessing.

(i) Complete the table by identifying the most appropriate protocol for each of the tasks the student is performing.

Task	Protocol
Requesting to view a news webpage from a web server	
Entering a username and password to access their bank account	
Downloading a text document from a web server	
Checking for new emails in their inbox	

[4]

Many candidates demonstrated an understanding of common protocols. The most common correct responses were giving HTTP and HTTPS as protocols for the first two tasks.

Responses to the last two tasks were more commonly inaccurate. A range of protocols were given including SMTP for email.

Question 2 (a) (ii)

(ii) Some protocols have layers.

Give **two** reasons why protocols have layers.

1 .....

.....

2 .....

.....

[2]

Candidates were often able to show an understanding of layers but could not say why layers are used. The most common responses referred to the need for independence between layers, and that it provides the ability to change one layer without having to change/impact on any other layers.

Question 2 (b) (i)

(b) The student's computer is part of their home Local Area Network (LAN). The LAN currently only has wired connections.

(i) One characteristic of a LAN is that they are set up over a small geographical area.

Give **one** other characteristic of a LAN.

.....

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

Candidates often gave a benefit of a LAN instead of a characteristic. This was often in comparison to a WAN. Examples included that it is cheaper, or that you can share devices and transfer data. Some responses identified the use of owner-owned hardware, or that third-part hardware was not required.

Question 2 (b) (ii)

(ii) Describe the benefits of the student changing their home LAN to include wireless connections.

.....

.....

.....

.....

.....

.....

.....

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

Candidates were often able to explain the benefits of including wireless connections. Common answers included the ability to be mobile and move around the home and allowing a wider range of devices to connect to the network.

Some candidates extended their answers by explaining or justifying the wider range of devices. For example by stating mobile phones do not have wired ports.

Some responses answered the question as though it was excluding wired connections all together and that the wires were being replaced; this did not answer the question asked which was the benefits of it including wireless – as well as wired.

Question 2 (b) (iii)

(iii) State **two** drawbacks of changing their home LAN to include wireless connections.

1 .....

.....

2 .....

.....

[2]

Candidates often demonstrated a good understanding of the drawbacks of wireless connections. Common responses included lower bandwidth and possible interference from other devices and/or objects.

In this response some candidates stated that wireless connections could be slower – but did not give enough information to explain what was slower.

Exemplar 1

1 Not as fast as wired connections.

2 It is over a small geographical area meaning that

[2]

The response in Exemplar 1 has identified that wireless is “not as fast as wired connections”. However, the candidate has not specified what it is not as fast at doing. To gain the mark, the candidate could refer to the transmission speed, the speed that errors are corrected, the speed that it loads, etc.

Question 2 (a) (i)

2 An airport has computers that are connected together on a Local Area Network (LAN).

(a) Each computer has an IP address and a MAC address.

(i) Give **one valid** example of an IPv4 address and **one valid** example of an IPv6 address.

IPv4 .....

.....

IPv6 .....

.....

[2]

Many candidates found this question challenging with few candidates giving valid IP addresses. IPv4 was more commonly accurate, although a common error was giving numbers greater than 255.

Few candidates were able to give an IPv6 address. Common errors including giving 6 groups of numbers and separating each group with a full stop.

Question 2 (a) (ii)

(ii) Describe the format of a MAC address.

.....

.....

.....

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

The most common responses given marks included identifying that it is usually in hexadecimal and that the groups are separated by colons or hyphens. Some candidates identified the two separate parts of the MAC address.

Question 2 (b) (i)

(b) The airport currently has wired connections in their Local Area Network.

(i) Describe **two** benefits to the airport of using wired connections in their network.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

Candidates were often able to identify benefits of wired connections but did not include application to the airport. For example, identifying that data was more secure but then repeating this same point by saying data is less likely to be intercepted. To gain the extra marks candidates needed to consider why each point was important in the airport, for example security is important due to the sensitive or private data that is being transmitted around the airport, or the high risk data that could potentially interfere with flights.

The most common benefits included the faster transmission speed and the increased security.

Question 2 (b) (ii)

(ii) Explain the reasons why the airport should also allow the network to be accessed using a wireless connection.

.....

.....

.....

.....

.....

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

In this question candidates needed to consider why wireless connections should also be allowed. Some candidates inaccurately took this as instead of wired and explained why this should be used instead, for example because they won't need any cables in the airport. A common response was that wireless was cheaper than wired, when there was already a wired connection so adding a wireless connection as well would be an extra cost instead of saving money.

Common responses included the ability to move around and stay connected, as well as the larger number of devices that could connect. Some candidates identified that devices may not have ports that allow for a physical wired connection.

The stronger responses included direct application to the airport, for example identifying the need for staff to respond to problems whilst in different areas of the airport such as tracking luggage or communicating problems.

Question 2 (c) (i)

(c) One office in the airport has five computers connected to one switch. There are two printers in the office that can be accessed by all computers.

The computers are connected using a star topology.

(i) Draw a diagram to show how the five computers, switch and two printers are connected in a star topology.

[3]

Many candidates were able to draw a diagram that included the five computers, the switch and the two printers. Some candidates did not label these items, instead drawing eight boxes without identify which device each one represented.

Candidates often joined these devices to the switch, with printers occasionally being connected to other computers that were then connected to the switch. Some candidates did not identify the central device, or incorrectly included an extra central device such as a router or a server.

Some candidates then included extra connections that created a mesh network instead of a star topology.

Question 2 (c) (ii)

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

Benefit .....

.....

Drawback .....

.....

[2]

Candidates were often able to give an appropriate benefit, most commonly that it was easier to add a new computer to the network. Candidates also commonly identified the drawback that the network is dependent on the central device.

Question 2 (c) (iii)

(iii) Describe the role of the switch in the star topology.

.....

.....

.....

.....

.....

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

Candidates commonly identified that the data from each computer in the network is sent directly to the switch, as well as this data then being sent to the destination. Some candidates confused a switch with a hub and identified that the data was sent to all devices connected to it.

Some of the stronger responses identified how the switch records the MAC addresses of devices connected to it and used these to identify which device the data needed to the transmitted to.

Misconception

A common misconception was that a switch performed the same role as a server, with candidates incorrectly identifying that the switch stored the data for devices in the network and that the switch provided services to the connected devices.

Question 4 (a)

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

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

1 .....

.....

2 .....

.....

[2]

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

Misconception

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

Question 4 (b) (i)

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

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

.....

.....

.....

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

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

Misconception

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

Question 4 (b) (ii)

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

Benefit .....

.....

.....

.....

Drawback .....

.....

.....

.....

[4]

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

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

Question 4 (c) (i)

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

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

.....

.....

.....

.....

.....

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

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

Question 4 (c) (ii)

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

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

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

[4]

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

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

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

Exemplar 2

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

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

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

Question 4 (d)

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

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

.....

.....

.....

.....

.....

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

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

Misconception

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

Question 4 (e) (i)

(e) Users will have access to the internet.

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

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

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

Question 4 (e) (ii)

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

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

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

[4]

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

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

Question 4 (e) (iii)

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

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

.....

.....

.....

.....

.....

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

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

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

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

Exemplar 3

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

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

Question 4 (f)

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

Legislation .....

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

.....

.....

.....

.....

.....

.....

[4]

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

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

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