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OCR
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GCSE (9-1)

Examiners' report

COMPUTER SCIENCE

J276
For first teaching in 2016

J276/01 Summer 2018 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates. The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report. A full copy of the question paper can be downloaded from OCR.

Paper J276/01 series overview

This was the first series for the new GCSE Computer Science. Paper 1 was the first of the two examination components for the new qualification.

The component focuses on:

- systems architecture
- memory and storage
- networks
- system security
- system software
- ethical, legal, cultural and environmental concerns.

The component also incorporates the synoptic elements of algorithms that have a main focus in paper 2. This was covered in question 1bii where candidates were required to produce an algorithm to meet a set of criteria.

To do well in this paper candidates need to have a secure knowledge of the different computer systems that exist, and how the components etc. work to create devices that people can use. Candidates need to be able to use their knowledge and apply it to a scenario, considering the benefits and drawbacks in a range of circumstances, and be able to convey this in their answers. Candidates would benefit from exploring the uses of different types of hardware in a variety of circumstances, and from experiencing a range of applications where the hardware, software and network technologies can be utilised.

Candidate performance overview

Candidates who did well on this paper generally did the following:

- applied their knowledge to the context within each question, giving appropriate solutions for the given situation
- considered the command word in the question and appropriately expanded their answers where a description or explanation was required
- gave a balanced discussion to the Quality of Written Communication question, covering a variety of points, and giving both positive and negative impacts.

Candidates who did less well on this paper generally did the following:

- gave short answers or key words as an answer that demonstrated a lack of understanding or depth of knowledge
- failed to consider the context and gave generic answers that may have been irrelevant, or inappropriate for the situation
- failed to produce an algorithm in response to question 1bii, instead repeating the question without any further detail or explanation of how the algorithm would work.

Question 1 (a) (i)

1 William is creating a film for a school project using a digital video camera.

(a) The digital video camera has a secondary storage device.

(i) Explain why the digital video camera needs secondary storage.

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..... [2]

This question required candidates to consider the device, its use and the purpose of secondary storage in this situation. Many candidates were able to identify the need of the device to store data. More able candidates were able to extend this to explain the need to store it after the device is turned off, or for transporting the data to another device. A common error was describing the need for backing up the data or that there was insufficient storage in the primary memory which demonstrated a lack of understanding about the differences between primary and secondary memory.

Question 1 (a) (ii)

(ii) The digital video camera uses solid state storage.

Explain why solid state storage is the most appropriate type of storage for the digital video camera.

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..... [4]

This question required candidates to consider the use of the digital video camera, the benefits of solid state storage, and where these meet. More able candidates were able to identify the number of benefits and expanded these to explain why they were useful in this specific scenario. Less able candidates often gave generic benefits of solid state storage devices, without applying them to this scenario. In some cases lists of benefits were given, which would support a question asking them to state the benefits, but the use of explain required candidates to give further explanation. The most common answers related to the durability and robustness of the device. Some candidates repeated their response to part (a) (i) where they explained the purpose of secondary storage, and did not identify the specific type of storage the question required.

Question 1 (b) (i)

(b) William transfers the videos to a computer for editing.

(i) The computer has 1GB of storage free.

Calculate the number of videos that could be stored on the computer if each video was 100MB in size.

Show your working.

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

Most candidates were able to answer this question fully. They performed the correct calculation and gained the correct answer, rounding the number of videos appropriately. The most common error involved candidates multiplying 100 by 1000.

Question 1 (b) (ii)

(ii) A program needs to calculate the size of files in bytes. The program must:

- Ask the user to input a file size in megabytes
- calculate and output the number of bytes this represents in a user friendly format (e.g. `"There are 5242880 bytes in 5MB"`).

Write an algorithm using pseudocode to calculate the number of bytes in a given number of megabytes.

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..... **[6]**

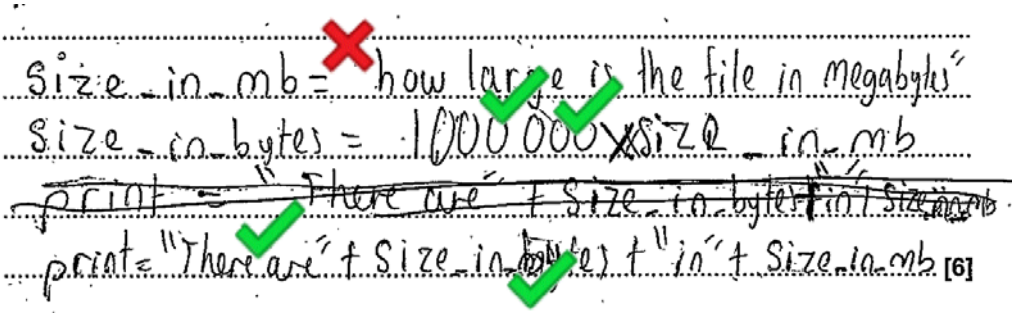
This question covered the synoptic algorithm element of the examinations. Candidates were required to use their knowledge of binary numbers to write a pseudocode algorithm. Most candidates attempted to write a pseudocode algorithm. A small number of candidates drew a flowchart, which does not meet the criteria of pseudocode. Most candidates were able to gain at least some marks, most commonly for the output of a message, and then input of the required data.

Common errors including inaccurate use of assignment, for example INPUT = FileSize is incorrect. This line of code states that the data within FileSize is stored in INPUT. The correct assignment is FileSize = INPUT.

Candidates need to be aware of how to output strings and values within variables. These could have been output as individual statements, but when combined candidates need to differentiate between the variables and text. For example, OUTPUT (The new file size is & FileSize) makes use of concatenation, but the text is not identified as a string and requires speech marks e.g. OUTPUT (The new file size is & "FileSize").

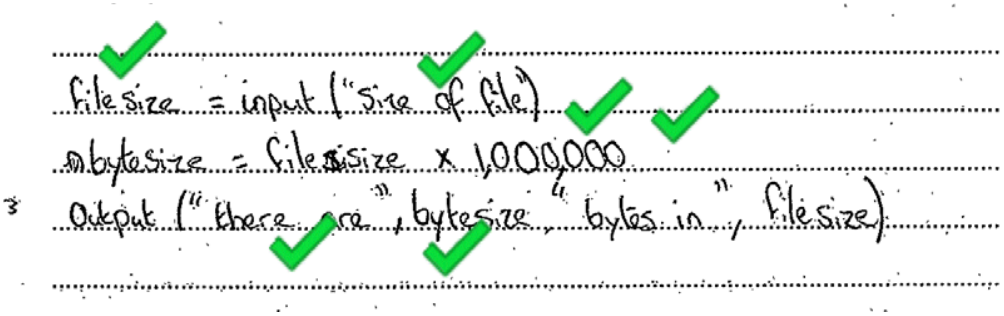
Some candidates did not attempt to output a message to the user, asking them to input the file size. Candidates need to read all aspects of the question carefully to make sure they are meeting all of the criteria.

Exemplar 1



This candidate has not identified that "how large is the file in megabytes" is an output, and has not explicitly asked for an input therefore cannot gain either of these marks. This first line of code is assigning a string to the variable size_in_mb. This error is not followed through, and the candidate has performed the correct calculation, and then output an appropriate message along with the new variable.

Exemplar 2



This candidate has outputted an appropriate message and read the input into the variable filesize. They have performed the appropriate calculation (although * is preferable for multiplication, as an algorithm x is accepted). They have output an appropriate message and the correct variable.

Question 1 (c) (i)

(c) William's computer has utility programs installed including automatic backup.

(i) William can choose between a full or incremental backup.

Identify the backup method William should use to backup the computer, justifying your choice.

Method: .....

Justification: .....

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

Candidates could choose either method for this question; the important element was their justification. Neither method was identified as being better than the other, but candidates needed to consider the scenario and apply their knowledge to it.

Most candidates gained marks for describing what their chosen method of backup involved. More able candidates were able to apply the amount of data; timescales etc. to their chosen methodology, and justify their decision. Weaker candidates attempted to describe backup and the generic benefits of backing up data, as opposed to justifying the method they had chosen.

Some candidates successfully identified that both would be appropriate, and gave a reasoned justification that incorporated the use of both. For example using a full backup initially and then incremental for the successive backups.

Question 1 (c) (ii)

(ii) Give **one** additional utility program William could make use of and describe how he would use it.

Utility program: .....

Description of use: .....

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.....

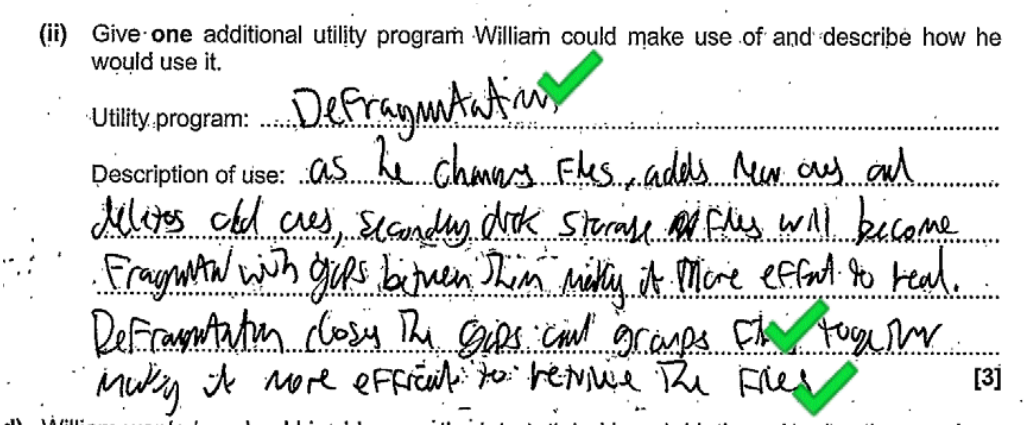
[3]

This was an open question that required candidates to consider utility programs they have learnt about and choose one that would be appropriate for an individual user.

The most common answer was defragmentation. Candidates were then required to describe its use. Many candidates described a fragmented disc and the problems associated with it – which does not answer the question. Some candidates then described the use of a defragmenter to speed up access to files. A common misunderstanding here was that a defragmenter increases the speed of a computer. Speed requires quantification in an answer, because it does not make a computer work faster, or process data faster, it allows faster access to the stored data.

Other common answers included disc clean-up and anti-virus.

Exemplar 3



This candidate has given defragmentation. They have then explained how a disc becomes fragmented, which does not gain marks because it is not answering the question. At the end of their answer, they explain how defragmentation is used to group files together, and making the retrieval of the files more efficient.

Question 1 (d)

(d) William wants to upload his videos on the Internet and is considering releasing them under a Creative Commons license.

Explain how a Creative Commons license will impact the use of William's videos by other people.

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

This question required candidates to demonstrate their understanding of a Creative Commons license to the context of the use of someone else's work. Some candidates did not make full use of the context and answered the question by defining the licence. Most candidates were able to explain how other people would be able to use or edit the videos themselves and then redistribute it. More able candidates were able to describe the different Creative Commons licenses available and how each of these would impact the use of the videos. A common misconception was that Creative Commons automatically copyrighted all material so that no one else could use, edit or distribute the videos.

Exemplar 4

This means the public will be able to use his work without asking permission. This comes with certain conditions from which william can chose. For example ATTribution means that he must be credited if anyone distributes his work after using it or non Commercial means it cannot be used for commercial purposes.

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

This good response shows a clear understanding of Creative Commons licensing and its different forms. They have identified that the public are able to use William's work and then given the examples of Attribution and the implication that William must be credited if his work is used. This has already gained the 3 marks, but they continue to describe the need for the work to be used non-commercially.

Question 2

2 A house has computers in each room and a central router. Every room allows both Ethernet and WiFi connections to the router.

(a) Identify if the house network is a LAN (local area network) or a WAN (wide area network). Justify your choice.

Network type: .....

Justification: .....

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[3]

Most candidates were able to correctly identify the network as being a LAN. Many of these were also able to justify it based on the size of the network. Fewer candidates were able to justify the network beyond its size. Some candidates looked to the next question and took the idea of the network being wireless or using Ethernet connections as meaning it was a LAN, not understanding that a WAN can also make use of these connections.

Question 2 (b)

(b) The following table has descriptions of Ethernet and WiFi.

Tick (✓) **one** box in each row to identify if the description is more appropriate for Ethernet or WiFi.

Description	Ethernet	WiFi
A wired connection		
More likely to be affected by interference		
Data can be transmitted at a faster speed		
Wireless transmission		
Shorter transmission range before data is lost		

[5]

This question was answered well with the majority of candidates getting each answer correct.

Question 2 (c) (i)

(c) (i) Describe the purpose of the router in the house's network.

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

This question required candidates to demonstrate their understanding of a router and its purpose in a network. Candidates need to have an understanding of the purpose of the hardware in a network as to the roles is performs, and how it does this. Less able candidates gave generic descriptions such as 'it connects devices together', or 'lets a user go on the Internet'. These are not in-depth enough to explain the actual purpose of the router, i.e. to receive packets from a computer, read the address and forward the packet to its destination. Similarly, with access to the Internet, the router receives the package to go onto the Internet, packets it appropriately for the new type of network and then sends it onto the new network. The more able candidates were able to describe the purpose of directing packets to their destination, as opposed to sending it arbitrarily to other devices.

Question 2 (c) (ii)

(ii) Identify **two** additional items of network hardware, apart from cables and a router, that may be used within the house network.

1 .....

2 .....

[2]

Many candidates were able to identify at least one device, most commonly switches and hubs.

Question 2 (d) (i)

(d) A user enters a uniform resource locator (URL) into a web browser on one of the computers in the house. A system is then used to find the IP address of the web server associated with the URL.

(i) Name the system which matches URLs to IP addresses on the web.

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

This question required an understanding of a Domain Name Server/System to convert URLs to IPs. Few candidates were able to identify this system, with many making guessing such as HTTP. Many candidates did not attempt to answer this question.

Question 2 (d) (ii)

(ii) The following statements describe what happens after the IP address has been found and returned to the user's computer.

There are **five** missing statements in the table.

Write the letter of the missing statements from the table in the correct place to complete the description.

1 The request is put into packets

2 .....

3 The packets are sent across the network

4 .....

5 .....

6 If they have not arrived:

7 A timeout is sent to request the packets are resent

8 If they have arrived:

9 .....

10 .....

Letter	Statement
A	The server checks if all the packets have arrived
B	The packets are put in order
C	The request is processed by the web server
D	The packets are received by the host server
E	Each packet is given the address and a number

[5]

This question required an understanding of how packets of data are sent across a network. Candidates were required to read through the statements and order them logically. The more able were able to identify the appropriate sequence. Less able candidates confused some of the statements, such as identifying the request as being processed before the packets were received.

Question 2 (e) (i)

(e) The house owner is concerned about potential threats to the network from being connected to the Internet.

(i) Describe **three** possible threats to the computers connected to the network and give **one** way each threat can be reduced or prevented.

Threat 1 .....

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Prevention .....

Threat 2 .....

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Prevention .....

Threat 3 .....

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Prevention .....

[9]

This question required candidates to consider the different threats to networks and computers that they have learnt about, and to identify which are appropriate in this situation. Most candidates were able to identify three threats, but at times these were not appropriate to the scenario, for example describing denial of service threats to a website, and SQL injection. This identifies the importance of candidates reading the questions carefully and identifying whether it is asking for a generic response i.e. a recall of knowledge (AO1), or an application of their knowledge (AO2). The most common threats identified included viruses and hackers, with candidates being able to describe the threats and identify appropriate measures to prevent them. Some candidates gave repeated answers, for example giving a virus as a threat, then a worm, then a Trojan – both of which are examples of viruses therefore already covered by their previous answer.

Exemplar 5

(i) Describe **three** possible threats to the computers connected to the network and give **one** way each threat can be reduced or prevented.

Threat 1 Distributed Denial of Service attacks occure when the network is flooded with unwanted packets. The sheer volume of packets crashes the network

Prevention Use a virtual Private network (VPN

Threat 2 Downloading files from the internet that may contain a virus. This virus may then spread accross the network damaging files and data on every device on the network

Prevention Install an antivirus on all devices

Threat 3 Packet sniffing is when data packets are intercepted when travelling accross a wireless network. Packets can then be stolen and data lost

Prevention Ensure packets are encrypted

[9]

This candidate has given DDOS for the first answer which is not appropriate to the context; this is a threat to a webserver which is not part of the house owner's home network. They have given two further appropriate threats, described these appropriately and given reasonable preventions. It is important that candidates consider the context and give threats that are appropriate to the situation given in the question.

Question 3

3* A small island has 100 people living on it. The island has just been connected to the Internet, after previously having no Internet or mobile phone signal.

Discuss the impact on the island's inhabitants and businesses of getting access to the Internet.

In your answer you might consider the impact on:

- inhabitants
- businesses
- ethical issues
- privacy issues

..... **[8]**

Most candidates tackled this question well, demonstrating a good understanding of the potential issues and structuring an appropriate response. The most common responses were given as essays, with the more able candidates allocating a paragraph to each to areas given in the questions.

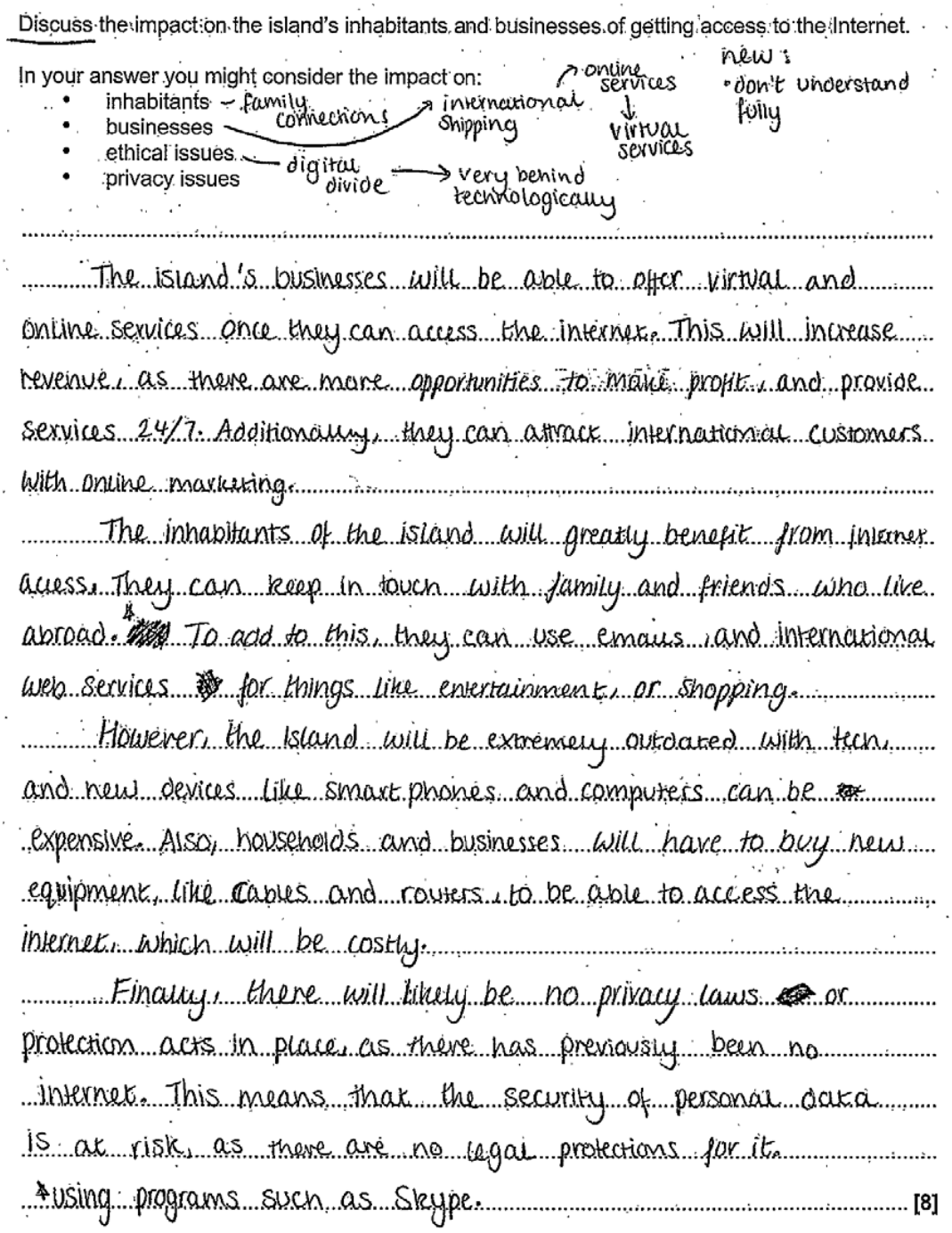
The question required a discussion of the impact of the Internet on both the inhabitants and businesses. A discussion of the impact requires both positive and negative impacts. The more able candidates tackled each area in turn, giving the positive and negative sides to each area.

Less able candidates provided limited depth in their responses, giving an example of a drawback to a business but not then expanding this to explain the potential impact.

More able candidates were able to evaluate the impact and gave a reasoned conclusion that summarised their findings.

There were some answers where candidates assumed that without the Internet the inhabitants had no means of communication, access to and/or knowledge of the world beyond their island.

Exemplar 7



Discuss the impact on the island's inhabitants and businesses of getting access to the Internet.

In your answer you might consider the impact on:

- inhabitants – family connections → international shipping
- businesses → online services → virtual services
- ethical issues
- privacy issues – digital divide → very behind technologically

new:
- don't understand fully

The island's businesses will be able to offer virtual and online services once they can access the internet. This will increase revenue, as there are more opportunities to make profit, and provide services 24/7. Additionally, they can attract international customers with online marketing.

The inhabitants of the island will greatly benefit from internet acuess. They can keep in touch with family and friends who live abroad. To add to this, they can use emails and international web services for things like entertainment, or shopping.

However, the island will be extremely outdated with tech, and new devices like smart phones and computers can be expensive. Also, households and businesses will have to buy new equipment, like cables and routers, to be able to access the internet, which will be costly.

Finally, there will likely be no privacy laws or protection acts in place, as there has previously been no internet. This means that the security of personal data is at risk, as there are no legal protections for it using programs such as Skype. [8]

This candidate began by describing the advantages to business, and then the benefits to inhabitants in paragraph 2. They have identified a drawback to inhabitants, and a general drawback of security risks – covering privacy/ethical issues. The candidate has covered at least three of the bullet points given in the question and given both positive and negative impacts. It was not credited with full marks because it was felt there could have been further expansion e.g. how the lack of security could impact the businesses, and an overall conclusion as to the impact.

Exemplar 8

Small businessed and large businesses would have access to the internet, goods could be transferred digitally. However with minimum privacy barriers the internet could disconnect with intersevice.

Next the inhabitants would be able to learn & be properly educated. This would be helpful because developing the island would be ideal. Businesses would grow with the islanders gradually being more computer orientated, companies distributing the internet would make more money and have to deal with growing issues ~~and like~~ is it's ethical to use the internet

This candidate has given a point of relevance in the first paragraph, but not explained how this is an impact. They have also attempted to give a privacy issue, but this is vague. The second paragraph states that inhabitants can now be educated, but they could be without the Internet – this is not an impact; if they had explained that it gives easier access to a greater range of information then this would have been more relevant. They have identified that businesses can grow through greater distribution, but again this is not expanded suitably into a positive impact. The candidate has given a couple of points of relevance and attempted to explain them, but it is lacking depth and clarity. There are two areas covered. This is a low-medium level response, but the relevant points allowed it to gain access to the medium band.

Exemplar 9

In your answer you might consider the impact on:

will start to attract people
- inhabitants ↑
- businesses ↑ - will be come more popular
- ethical issues ↓

will be able to industrialise better
- privacy issues ↑ – as they will be inexperienced with this

Ethically this island will now become more knowledgeable about healthcare and become stronger with there ability to industrialise.

Privacy issues as they will be inexperienced with the internet they may fall for scams which expose personal details.

Businesses will expand and become more popular as they are able to advertise more. The number of businesses will increase over time due to this to.

The islands inhabitants will increase as they will become known for globally. There will be an increase in modernisation which will allow the people to live better and healthier.

[8]

The candidate has given a number of points which are all relevant. They have covered at least three of the bullet points. The response lacked depth for each point, so despite there being a number of points, these were not explained as to their impact. This is therefore restricted to the middle band.

Question 4 (a)

4 Alicia has designed a computer using Von Neumann architecture.

(a) Describe the purpose of **two** registers that are used by Von Neumann architecture.

1 .....

.....

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2 .....

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.....

[4]

Many candidates were able to accurately name two registers. The more able were able to accurately describe the purpose of these registers. Some candidates were not specific enough in their responses to gain the descriptive marks, or repeated the name of a register without the purpose, e.g. 'The memory address register stores the address of the data'.

Question 4 (b)

(b) The CPU has a clock speed of 3.8 GHz.

Describe what is meant by a clock speed of 3.8 GHz.

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

This question was answered well with many candidates able to demonstrate an understanding of the clock speed of a computer. Fewer candidates correctly translated the 3.8 GHz into the correct number of instructions/FDE cycles performed. Less able candidates did not identify an appropriate time frame, for example 'the number of instructions it can process' has a different meaning to 'the number of instructions it can process per second'. Another common misconception was it is the number of instructions it can perform at a time, a processor can only perform one instruction at a time.

Question 4 (c)

(c) Alicia says:
"My computer has a quad-core processor, so it will run twice as fast as a computer with a dual-core processor."

Explain why this statement is not always true.

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

Most candidates were able to identify other features that could also have an impact on the speed of the computer such as the processor speed, amount of RAM etc. The more able candidates were also able to identify that the tasks being performed will also impact on the speed, for example how software may not be optimised for quad-core, or that a process may have to wait for a different process to finish execution before it can be processed.

Question 4 (d) (i)

(d) The computer will only have 2GB of RAM, but Alicia says that virtual memory can be used instead of adding more RAM.

(i) Explain how virtual memory can compensate for the lack of RAM in Alicia's computer.

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

This question required candidates to explain how virtual memory works to make up for a lack of RAM. The most common responses included a description of the use of secondary storage as temporary RAM. Fewer candidates were able to explain the actual use of it, i.e. how data is transferred from RAM to VM to create more space in RAM, and how this is then moved back when required. Common misconceptions included candidates describing whole software being moved to VM.

Question 4 (d) (ii)

(ii) Explain why it would be beneficial for Alicia to get more RAM instead of relying on virtual memory.

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

This question required an understanding of the benefits of RAM over VM. The less able often described RAM as being faster than VM, without any context as to what it is faster at, or why, often referring to it as making the computer faster. The more able were able to identify that data in VM needs to first be transferred to RAM before it can be accessed by the processor, and that this takes more time than accessing it directly from RAM. A common misconception was that it was slower access simply because it is further away. The VM could be closer to the processor, but the data would still need to be moved to RAM before it could be accessed, and this is what slows down the access speed.

Question 5 (a)

5 When connecting computers into a network, the use of appropriate protocols are important.

(a) Explain what is meant by a protocol.

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

Most candidates were able to answer this question well, describing a protocol as a set of rules, although fewer added the context of networks as required by the question. Common misconceptions included descriptions such as a set of instructions, or steps, or an algorithm.

Question 5 (b) (i)

(b) For each of the scenarios below, identify the most appropriate protocol to be used and explain the function of the protocol.

(i) A user wants to transfer a file directly from his computer to his friend's computer.

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

Many candidates were able to identify the appropriate protocol of FTP. Few candidates were able to explain the function of this protocol. Common answers including redefining it as transferring a file, and not actually the function of it.

Question 5 (b) (ii)

(ii) A customer wants to securely log into her bank's website to check her account balance.

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

This protocol was often identified correctly and many candidates were able to describe its function in encrypting the data to ensure its security. Some candidates gave a description of it showing a padlock on the browser, but this does not explain the function of the protocol.

Question 5 (c)

(c) Explain the difference between how the IMAP (Internet message access protocol) and SMTP (simple mail transfer protocol) protocols are used.

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

This question asked for the difference between the two protocols. Some candidates gave the similarities, or generic descriptions of each without actually identifying the difference. Many candidates described these as sending data without direct reference to actually what is being transferred e.g. emails.

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