Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

COMPUTER SCIENCE

J276
For first teaching in 2016

J276/01 Summer 2019 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 1 series overview

This was the second year this paper has been sat. Paper 1 was the first of the two examination units for this qualification.

The unit focuses on:

- Systems architecture
- Memory and storage
- Networks
- System security
- System software
- Ethical, legal, cultural and environmental concerns.

The unit also incorporates the synoptic elements of algorithms that have a main focus in paper 2. This was covered in Questions 3bii and 3biii where candidates were required to complete an algorithm to meet a set of criteria and write a new line of code to output a result.

A mix of candidates took the exam and there was evidence of some excellent understanding of key topics which some candidates expressed appropriately. The quality of written communication question was answered particularly well, with candidates demonstrating their ability to structure their responses appropriately.

Some areas stand out as areas of weakness, particularly candidates' understanding of virtual networks.

To do well in this paper candidates need a secure understanding of the theoretical topics and need to be able to apply this knowledge to the scenarios presented in the examination; for example suggesting appropriate solutions to problems, and evaluating the benefits and drawbacks of certain technologies in a given scenario.

Note

As you are no doubt aware, Ofqual announced that programming skills for all GCSEs in Computer Science will be assessed exclusively by exam from **summer 2022**. Since the announcement, we've been working on how your updated GCSE (9-1) Computer Science could look for first teaching in September 2020. Read Ceredig's blog which highlights what we've been working on so far. You can sign-up for email updates to ensure you are receiving the latest concise and informative newsletters and emails.

Section overview

Question 1 (a) (i)

1 Kerry wants to buy a new computer, but she does not understand what the different parts of a computer do.

(a) Kerry has heard of a CPU but does not know what it is.

(i) The following sentences describe the purpose of a CPU.

Complete the sentences by filling in the missing words.

CPU stands for ..... .

It is the part of the computer that fetches and executes the .....

that are stored in ..... .

The CPU contains the Arithmetic ..... Unit (ALU) and

the ..... Unit (CU).

[5]

This question required candidates to identify the missing key words in the sentences. Candidates tackled this question well and many were able to identify several correct missing words. CPU was regularly given correctly, as was Logic and Control.

Candidates found the other two words more challenging.

Instructions was often replaced by data, which is too vague because data is not executed as required in the questions.

Memory was the most common answer for the third space, but some candidates were more specific and correctly identified registers, or memory data register.

A small number of candidates put memory address register which was incorrect due to it not storing instructions, but the address of the instructions.

Question 1 (a) (ii)

(ii) Kerry is looking at two computers; one has a single core processor and the other has a dual core processor.

Explain why having a dual core processor might improve the performance of the computer.

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

This question required candidates to consider the reasons why the performance was improved. This 'why' was missed by some candidates who repeated the question by explaining that a dual core processor improved the performance.

Some candidates identified that it meant more processes could be run per second, but this was too vague because it is not one core that is completing more instructions per second, but two cores that can both process instructions at the same time; the latter part being required for the mark to be given.

Question 1 (a) (iii)

(iii) One computer has 64 kilobytes of cache and the other has 512 kilobytes of cache.

Explain how the cache size can affect the performance of the CPU.

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

This question required an understanding of how the cache size improves the performance, as opposed to the why of the previous question. This required candidates to demonstrate an understanding of what cache is and how it affects the computer.

Many candidates were able to identify that cache stored frequently used instructions, but fewer were able to demonstrate an understanding that the more cache meant an improved performance.

Some candidates gave the improved performance but without a context i.e. that the computer with more cache improved the performance.

Question 1 (b) (i)

(b) Both computers have RAM and ROM.

(i) The table has **five** statements describing RAM and/or ROM.

Tick (✓) **one or more** boxes in each row to identify if that statement describes RAM and/or ROM.

	RAM	ROM
Stores data		
The memory is volatile		
Data will not be lost when the computer is turned off		
Data is read-only, cannot be changed		
Stores currently running data and instructions		

[5]

This question required an understanding of the purposes and characteristics of RAM and ROM. This question was answered well by many candidates.

The most common error was the first box where some candidates only ticked one box i.e. stating that RAM stores data, but ROM does not.

Question 1 (b) (ii)

(ii) Give **one** difference between RAM and flash memory.

.....

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

Candidates tackled this question well, and many were able to give an appropriate differences, with some candidates making use of the table in Question 1bi to determine a difference.

Question 1 (c) (i)

(c) Kerry has 5GB of files to transfer from her laptop at work to her new computer. She has been told to buy an external solid state device to do this.

(i) Give **one** example of a solid state device.

.....

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

Answers were mixed to this question, which required candidates to identify a solid state device.

Some candidates put USB on its own, i.e. without memory stick, or drive. Candidates should be aware that USB on its own is a port and is not a storage device.

A common incorrect answer was hard drive which is a magnetic storage device.

Question 1 (c) (ii)

(ii) Identify whether the device given in **part (c)(i)** is an example of primary or secondary memory.

.....

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

Candidates were able to get follow through for identifying whether the device they named in part 1ci was primary or secondary memory.

Most candidates were able to correctly identify whether their device was primary or secondary; with secondary being the most common required response.

A small number of candidates identified a secondary storage device as being primary.

Question 1 (c) (iii)

(iii)* Kerry was originally going to use an optical storage device to transfer her files.

Discuss whether an optical or solid state device is the most appropriate media to transfer these files.

You may want to consider the following characteristics in your answer:

- portability
- robustness
- capacity
- cost

[8]

This question required candidates to structure a response that evaluated both optical and solid state devices for the given scenario.

Candidates can answer these questions in any way that conveys their understanding; for example, a table of optical versus solid state is an appropriate method of evaluating each, along with a conclusion as to which is more appropriate.

Many candidates were able to demonstrate a good understanding of the characteristics of both optical and solid state devices. Fewer candidates applied their knowledge to the scenario and only mentioned at the end as to what Kirsty should do.

The better responses referred back to the scenario in each section. For example, when identifying the capacity of each, candidates also referred to the 5GB Kirsty needs to move. When identifying the portability of each, candidates referred to the need for Kirsty to move her files from one location to another.

These responses showed that they were considering the scenario in each part of the question and were not just recalling their knowledge about the devices.

Exemplar 1

An optical device would be appropriate as they are ~~very very~~ portable and work with a lot of strength. However, they have complex moving parts, ~~and~~ a limited ~~to~~ amount of capacity aswell as being expensive and are easily damaged ~~when dropped~~.

A solid state device would be appropriate as they are small and so are portable. They ~~would~~ transfer data fast and can hold a large ~~amount of~~ capacity of data. However it costs more for a solid state device to be able to hold a larger capacity of data.

This candidate has made a number of valid points for both optical and solid state, but there are some errors in stated facts for optical.

There is no explicit application to the scenario, but some could be read as implied in the answer.

Exemplar 2

I think solid state would be more appropriate for transferring files.

On the one hand, solid state is more appropriate because it is more robust. Because solid state has no moving parts, it is less fragile than optical. Therefore it would suit Kerry as she would be transporting the storage device so it is likely to get dropped or banged around in a bag. Furthermore, solid state is likely to be a lot more portable than optical. This is because SSD's tend to be very compact and lightweight. For example, SD cards can store over 100 Gb and only be the size of a fingernail. This is best for Kerry as if she will be carrying the device she wants it to be compact and lightweight, so that it's easier to carry.

On the other hand, however, optical

Storage is usually a lot less expensive. Because Kerry only wants to transfer 5Gb of data once, she would want the device to be as inexpensive as possible. Furthermore, optical storage devices usually have a larger capacity than solid state. However Kerry may not need this as she only wants to transfer 5GB.

In Conclusion, Solid State would be more suitable for Kerry as it is more durable and more portable.

This candidate has given a well structure response with many valid points.

The candidate has referred to the scenario throughout.

There was a minor error which prevents the response gaining full marks.

Question 1 (c) (iv)

(iv) The filesizes of Kerry's files are usually displayed in megabytes (MB) or gigabytes (GB).

Calculate how many MB are in 5GB. Show your working.

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

This question was answered well by most candidates who were able to correctly perform the calculation. Some candidates did not show their working and were only able to gain the mark for the final answer.

Question 2 (a)

2 Xander's tablet computer comes with system software, including an operating system and utility system software.

(a) The operating system provides file management.

Identify **three** ways that Xander can make use of the file management facility.

1 .....

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2 .....

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3 .....

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

Candidates found this question challenging.

Many candidates identified incorrect features such as compression and encryption. Some candidates were able to identify one or two ways; commonly deleting files or transferring files.

Only a few candidates were able to identify three correct ways.

Question 2 (b) (i)

(b) The utility system software provides compression software. Xander uses this to compress an image.

(i) Explain how the compression software will compress the image file.

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

This question required candidates to demonstrate their understanding of compression to image files.

Many candidates were able to convey an understanding of generic compression; for example, the application of an algorithm, and the use of lossy/lossless compression.

Many candidates were also able to apply this to an image file; commonly the reduction of resolution/pixels and colour.

Some candidates did not answer the question of how it compresses the file, instead incorrectly answering why compression was used to reduce the file size.

Exemplar 3

(i) Explain how the compression software will compress the image file.

Colour depth It will remove [some of the colours that the human eye would not recognise making the image take up less space, it could also reduce the size of the picture which will get more space and also it could reduce the number of pixels of the human eye would not notice up it.

The candidate has identified that some colours are removed, or that the number of pixels would be removed. They have not expanded on these or explained the type of compression that is being used.

Question 2 (b) (ii)

(ii) Give the name of **two** other types of utility system software.

1 .....

2 .....

[2]

This question was answered well by many candidates who were able to identify two different examples of utility software. The most common answers included encryption and defragmentation.

Some candidates did not read the requirements for 'other' types i.e. **not** compression and gave compression as one of their answers.

Question 2 (c) (i)

(c) Xander also has a smart watch.

(i) Tick (✓) **one** box to show whether the smart watch or the laptop is an example of an embedded system.

	Is an example of an embedded system
Smart watch	
Laptop	

[1]

This question was answered correctly by the majority of candidates who were able to identify that a smart watch is an example of an embedded system.

Question 2 (c) (ii)

(ii) Justify your choice to **part (i)**.

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

Candidates were able to gain marks for explaining why a smart watch is an embedded system or why a laptop is not or a combination of the two.

The most common answers referred to the limited features of a smart watch, while a laptop is a general-purpose computer that can perform any number of tasks.

Some candidates gave a generic definition of an embedded system which was insufficient because the question required candidates to apply their knowledge to the scenario.

Question 3 (a) (i)

3 Hamish stores confidential documents on his laptop.

(a) Hamish needs his computer to be secure from unauthorised access when connected to a network.

(i) Describe the problems that can arise from unauthorised access to his laptop and confidential documents.

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

This question required candidates to consider the consequences of unauthorised access to the laptop and documents.

Candidates tackled this question well, with many candidates identifying potential problems such as deletion/modification of files, installation of files etc.

Some candidates gave appropriate consequences to Hamish such as loss of job or breaking of data protection act and the consequences of this.

Question 3 (a) (ii)

(ii) Describe **two** ways Hamish can help prevent unauthorised access to his laptop.

1 .....

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2 .....

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[4]

This question required candidates to apply their knowledge of computer security to the protection of a laptop against unauthorised access.

Some candidates incorrectly identified features to stop unauthorised users accessing the data once they were on the laptop. The question required responses on how to prevent them accessing the laptop to begin with.

The most common answers included use of firewalls and passwords. Few candidates were able to describe the actions performed by a firewall, instead repeating the question in that it stops unauthorised access.

More common were good descriptions of strong passwords or locking the laptop once a set number of incorrect passwords was entered.

Question 3 (b) (i)

(b) If unauthorised access does occur, Hamish would like to use encryption to add another layer of protection to his documents.

(i) Explain how encryption helps to protect Hamish's documents.

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

This question was answered well by many candidates who were able to identify that encryption scrambles data and that a key is required to read it.

Question 3 (b) (ii)

(ii) One encryption method is a Caesar cipher.

This Caesar cipher moves each letter of the alphabet **one** place to the right.

The following table shows the original letters in the first row, and the new letters in the second row.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A

For example, if the message read: `HELLO`

This would be stored as: `IFMMP`

The following pseudocode algorithm takes a string of uppercase letters as input and uses the Caesar cipher to encrypt them.

The functions used in the algorithm are described in the table:

Function	Description
`ASC(character)`	Returns the ASCII value for *character* e.g. `ASC("A")` returns `65`
`CHR(ASCIIvalue)`	Returns the single character for *ASCIIvalue* e.g. `CHR(65)` returns `"A"`
`subString(Value, Number)`	Returns the *Number* of characters starting at position *Value* (where 0 is the first character)

Complete the pseudocode algorithm to perform a Caesar cipher.

```
01 message = input("Please enter your string")
02 newMessage = ""
03 messageLength = message.length
04 for count = 0 to ..........
05     ASCIIValue = ASC(message.subString(..........,1))
06     ASCIIValue = ASCIIValue + ..........
07     if ASCIIValue >90 then
08       ASCIIValue = .......... - 26
09     endif
10     newMessage = .......... + CHR(ASCIIValue)
11 next count
```

[5]

This question tested candidates' understanding of algorithms and the use of strings in programming.

A noticeable number of candidates did not attempt the question.

The most common correct response was the first space to identify the number of iterations. The final space was also often answered correctly, identifying that the string is concatenated with the rest of the message.

Fewer candidates were able to identify the character being selected, or the value to add to ASCIIValue within the loop.

Question 3 (b) (iii)

(iii) The algorithm needs adapting. An extra line (line 12) is needed to output the encrypted message.

Write line 12 to output the encrypted message in pseudocode or programming code.

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

This question required candidates to identify the variable from part bii that stores the final encrypted message and to output it using any identifiable output keyword.

A common error was putting speech marks around new message i.e. 'newmessage' which would mean the words 'newmessage' would be output instead of the contents of the variable.

Question 4 (a) (i)

4 An office has a LAN (Local Area Network). The office has four employees who each have a laptop. The office also has one server and one networked printer.

(a) The office is set up as a star network with a switch at the centre. All devices are connected to the network using cables.

(i) Draw the devices and connections in the office star network. All devices must be clearly labelled.

[3]

Most candidates were able to gain at least 1 mark by drawing the required elements.

Fewer candidates were able to correctly label the central device as the switch; many incorrectly labelled this as the server, or server/switch. This error demonstrates a misunderstanding that all devices connect centrally to a server, instead of a device such as a switch.

Some candidates did not clearly label their devices or did not fully apply the scenario to the diagram i.e. labelling 'device' instead of the specific laptop, printer, server as required.

Question 4 (a) (ii)

(ii) Describe the role of the switch in the office network.

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

This question required an understanding of the purpose and function of a switch in a network.

A surprising number of candidates thought that the switch turns the network on and off.

The better answers conveyed that signals were transmitted from the devices to the switch, and that the switch then transmitted the signals to the destination.

A small number of candidates were able to demonstrate and understanding of how the switch records the MAC addresses of the devices attached to it and then uses these to forward data packets.

Question 4 (b) (i)

(b) The office introduces a WAP (Wireless Access Point) to allow network access to wireless devices.

The office manager has noticed that the performance of the network has recently decreased.

(i) Describe how introducing wireless access could have slowed down the network.

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

This question required an understanding of the differences between wired and wireless transmission.

Many candidates were able to correctly identify that wireless transmission is usually slower than wired transmission.

Many candidates were also able to explain potential interference in wireless transmission and what can cause this interference.

Question 4 (b) (ii)

(ii) Identify **two** other factors that can affect the performance of a network.

1 .....

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2 .....

.....

[2]

This question required candidates to consider what other else could affect the performance, other than a wireless versus wired network.

There were some excellent responses demonstrating a range of knowledge such as differences in bandwidth, the number of users (and collisions), the type of hardware used and even the topology of the network.

Question 4 (c)

(c) Explain what is meant by a Virtual Network.

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

This question required an understanding of what a virtual network is. A range of mark points were available for candidates who were able to demonstrate knowledge of virtual networks.

Few candidates were able to explain what a virtual network was. Many incorrectly identified it as cloud storage, or described it as being an entirely wireless network.

The better response gave a description of partitioning a physical network into more than one logical network that could be accessed from any location through the Internet.

Exemplar 4

an entirely software-based network, which uses the hardware of the physical network. It works by partitioning some of the physical networks bandwidth ~~to~~ to form a mini network.

The candidate has demonstrated their understanding of a virtual network being software based, and that the bandwidth is portioned for it.

Question 5 (a)

5 The IP address 192.149.119.226 is linked to the website with a URL of https://www.ocr.org.uk

(a) When https://www.ocr.org.uk is entered into a browser, the website homepage is loaded.

Describe the relationship between the website URL (https://www.ocr.org.uk), the IP address and the webserver.

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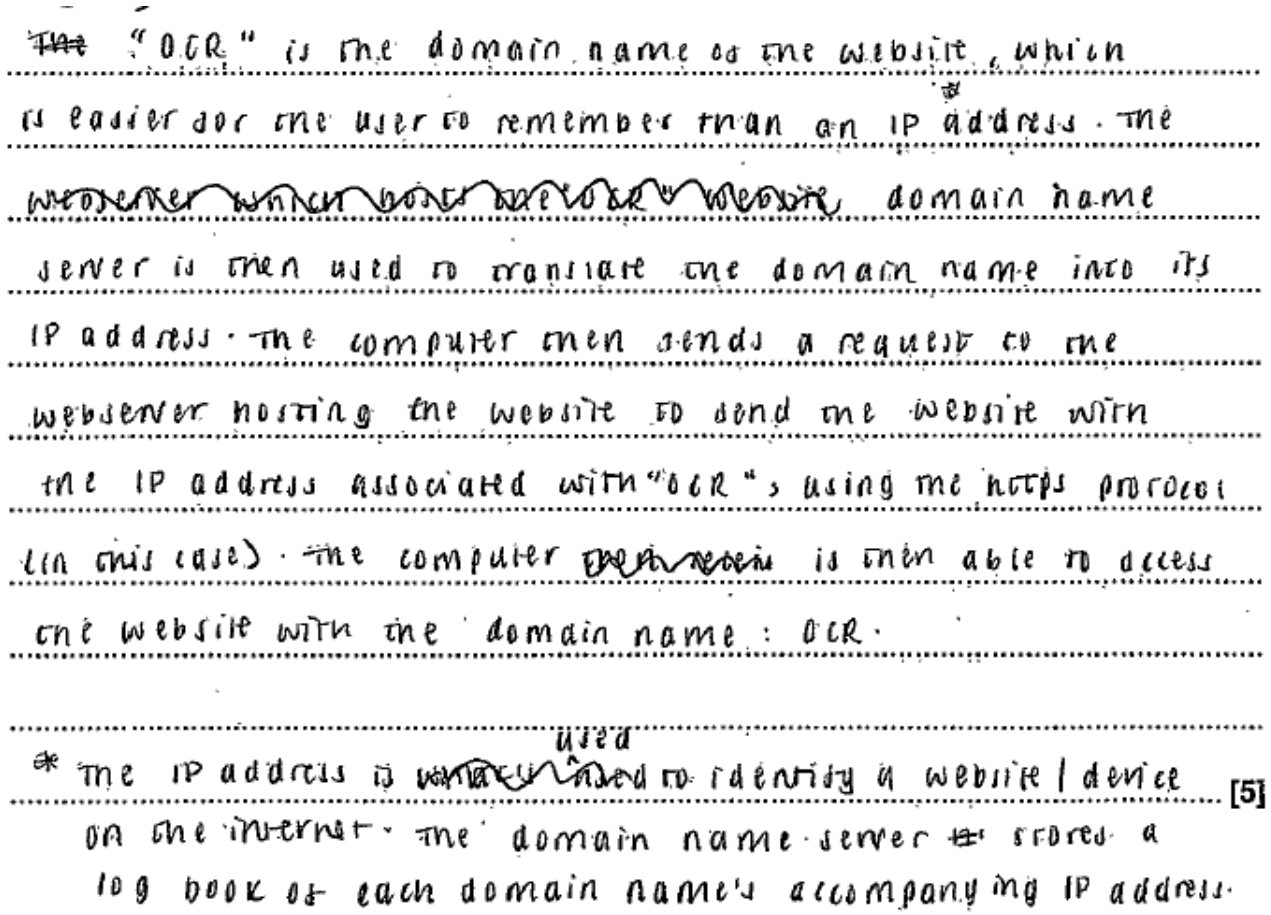
..... **[5]**

This question provided an opportunity for candidates to demonstrating their understanding of the links between URLs and IPs, and how websites are stored on web servers that have a URL and IP address.

The better answers gave a detailed explanation of how a URL is converted into an IP address through a domain name server.

Some candidates did not explain the relationship, instead giving the purpose of URLs as being user friendly, instead of detailed how it relates to the IP address and web server.

Exemplar 5

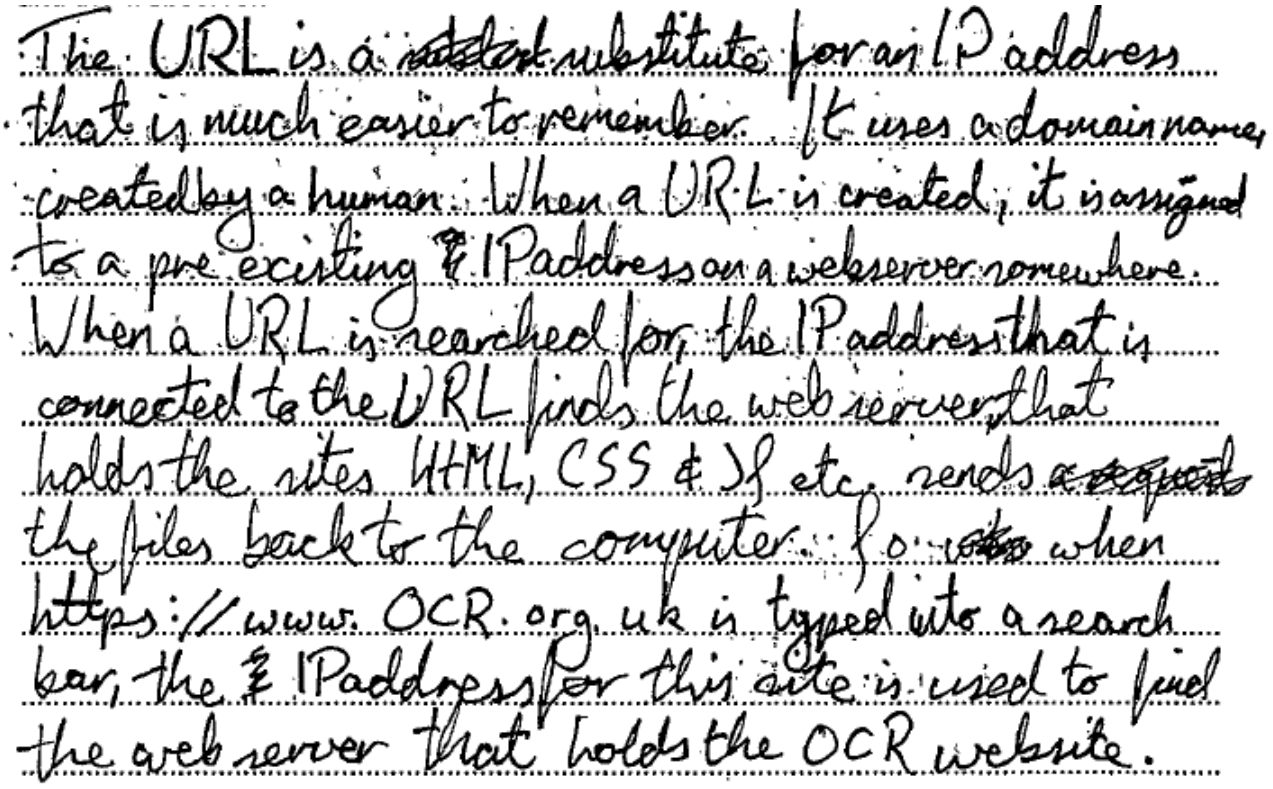


[5]

This candidate has given a good description of how a website is loaded, with the computer contacting the web server of the website.

They have also included (briefly) details about a domain name server being used to convert the domain name into the IP address.

Exemplar 6


The URL is a ~~network~~ substitute for an IP address that is much easier to remember. It uses a domain name, created by a human. When a URL is created, it is assigned to a pre existing IP address on a webserver somewhere. When a URL is searched for, the IP address that is connected to the URL finds the web server that holds the sites HTML, CSS & JS etc, sends ~~a request~~ the files back to the computer. So ~~when~~ when https://www.OCR.org.uk is typed into a search bar, the IP address for this site is used to find the web server that holds the OCR website.

This candidate begins by describing why a URL is used instead of the relationship between the required parts.

They do further down begin to detail how a web server stores the website and that this server sends the website back to the computer.

Question 5 (b) (i)

(b) Computers access the Internet using the TCP/IP model.

(i) The TCP/IP model uses layers including the application layer and transport layer.

Explain why the TCP/IP model uses layers.

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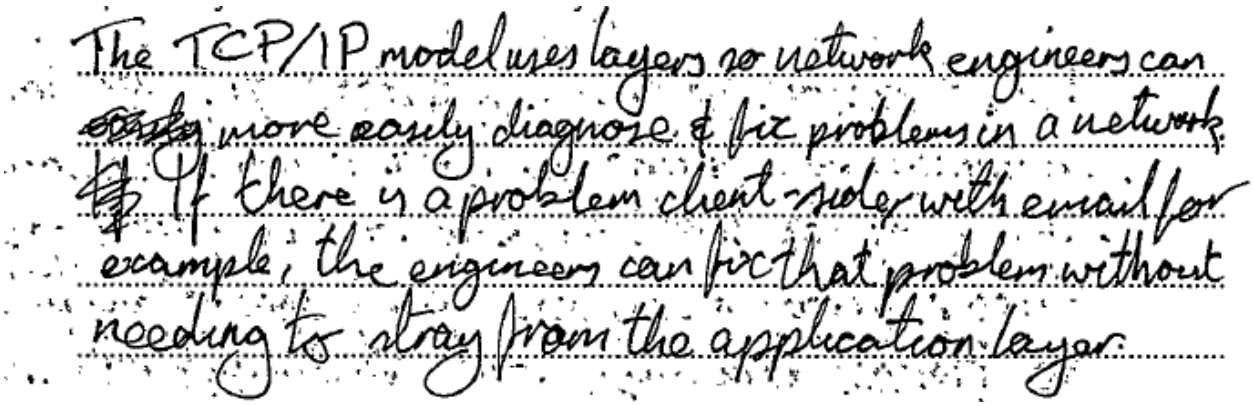
..... **[2]**

This question was answered well by many candidates who had clearly been taught the purpose of having multiple layers.

Candidates commonly responded with the ability to change one layer without impacting any others.

Some candidates did not explain why layers are used, and instead gave detailed descriptions of what each layer did, without actually answering the given question.

Exemplar 7



This candidate has given the common response of layers being independent, so one can be changed without impacting on the others.

Question 5 (b) (ii)

(ii) TCP/IP is one example of a protocol.

Give the name of **one** appropriate protocol for each task in the table.

Task	Protocol for this task
Sending an email from one mail server to another	
Transmitting a file from a client to a server	
Viewing a website using a web browser	
Downloading an email to your computer	

[4]

This question required candidates to apply their knowledge of different protocols to the given tasks.

Many candidates were able to correctly identify HTTP/HTTPS and POP/IMAP for the last two boxes.

The sending of an email was commonly mistaken for IMAP.

Question 6 (a)

6 Fiona is a software engineer. She is creating a new version of a computer game she released three years ago.

Fiona is considering selling the game online and not making it available physically in shops.

(a) Describe the environmental impact of Fiona's decision.

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

This question required an understanding of environmental impacts of selling software physically.

Many candidates were able to give detailed explanations as to the positive impact of not releasing a game physically, such as the reduction of materials for packaging.

Some candidates need not read the question fully and gave explanations as to how it would benefit Fiona to release it online and not in shops. This led to answers about the number of people it would reach and the income she would make, as opposed to the environmental impact.

Question 6 (b)

(b) Fiona releases her game under a proprietary licence.

Explain why a proprietary licence is a more appropriate choice than open source.

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

Candidates were able to demonstrate a clear understanding of the difference between a proprietary licence and open source software.

Common answers including Fiona being able to gain income from proprietary, and not releasing source code to prevent her program being edited.

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