

Examiners' report

GCSE

COMPUTER SCIENCE

**OCR Level 1/Level 2 GCSE (9-1) in
Computer Science**

J277

For first teaching in 2020

J277/01 Summer 2025 series

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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. A selection of candidate responses is also provided. 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 and the mark scheme can be downloaded from [Teach Cambridge](#).

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Paper 1 series overview

Component 1 focuses on theoretical concepts of Computer Systems including:

- systems architecture
- memory and storage
- computer networks, connections and protocol
- network security
- systems software
- ethical, legal, cultural and environmental concerns.

Candidates were often able to express their understanding of a range of topics and gave clear responses that made correct use of technical terminology. Some candidates made attempts at applying their understanding to the scenario and used expansions to link their points to the scenario.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• expanded each point made in Question 3 to explain how it applied to the given scenario • planned their response to Question 3 to make sure they covered all the requirements in the bullet points • demonstrated an understanding of network hardware and how a mesh topology is the physical connections between devices as opposed to the software and management of devices on the network.	• focused entirely on the negative points for Question 3, or only considered a potential increase in profit as a benefit • gave points related to the topic without answering the specific questions, for example defining the term bandwidth and not how it affects the performance of a network.

Question 1 (a)

1 A student is creating a presentation containing images and sound.

(a) One of the files is an audio recording.

Complete the description of how a computer stores sound. Fill in the gaps using the given list of terms. Not all terms will be used.

analogue	colour depth	higher	repeated	smaller
binary	digital	lower	sample rate	unique
bit depth	height	measuring	sampling	
byte	hertz	recording	seconds	

An sound wave needs to be converted into a digital sound wave.

Sound is when the amplitude of the sound wave is measured at set intervals.

The is the number of times a second the sound wave is measured. This is given in Hertz.

Each amplitude is given a binary number. The number of bits allocated to each sample is the

The the number of bits, the wider the number of amplitudes can be measured.

[6]

Candidates were often able to demonstrate a good understanding of sound representation, identifying the appropriate missing terms. Candidates most commonly correctly identified that an analogue wave is converted into digital.

The final space was often inaccurately completed with smaller, when instead it is the higher the number of bits the wider the number of amplitudes.

Question 1 (b) (i)

(b) The student creates 10 bitmap images using a computer.

Each image has a colour depth of 8-bits and a resolution of 800×500 pixels.

(i) Define the term pixel.

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

Some candidates found it challenging to define the term pixel. The most common accurate responses identified it as the smallest part of an image, or a single square of one colour.

Some responses described it as a square that contains many colours; while one pixel can have a different colour stored in it at different times, it can only ever have one colour at a time. Other inaccurate responses included describing it as a bit of data or just a square on a screen; when a square on a screen can be made up of many pixels.

Question 1 (b) (ii)

(ii) Calculate the total file size of the 10 images in kilobytes.

Show your working out.

.....
.....
.....

File size: kilobytes

[2]

Candidates were often able to accurately show part of the working, most commonly for multiplying 800 and 500. Fewer candidates were able to complete the calculation to gain the correct response. A common missed element was giving the file size of one image instead of multiplying it by 10 to give the file size of the ten images.

Question 1 (b) (iii)

(iii) State the minimum number of bits that will be needed to represent 240 different colours.

..... [1]

There were a mix of responses to this question, with some candidates giving 2^{240} , 256, etc. Some candidates identified the need for 8 bits but gave the response to the question as 2^8 , meaning that there would be 256 bits.

Question 1 (c)

(c) The student wants to use a secondary storage device to move their files to their home computer.

Identify whether the student should use an optical or solid-state type of secondary storage device. Justify your choice.

Optical or solid-state

Justification

.....

.....

.....

.....

..... [4]

Candidates were often able to justify the type of storage that they selected.

Solid-state was most commonly selected, with responses identifying the small size, durability, portability and large capacity. Some candidates stated that it was faster than optical, without referencing what it is faster at, i.e. reading/writing data.

Some candidates accurately justified solid-state, by identifying that it had sufficient capacity for the files and that it was portable.

The stronger responses justified the choices for the given scenario, identifying that images could have large file sizes so the solid-state would be more likely to hold all of the required files, or that the need to transport that device might damage an optical disk by scratching it.

Question 2 (a)

2 A computer has an operating system.

(a) Tick (✓) **one** box on each row to identify the operating system function that will manage each task.

Operating system function	Memory management	Peripheral management	User management	File management
Multitasking				
Renaming a folder				
Creation of user accounts				
Installation of a printer driver				
Transfer of data to and from RAM				

[5]

Candidates were often able to identify renaming a folder as file management.

Multitasking was most commonly incorrect, with a range of responses commonly including peripheral or user management.

Printer driver was occasionally inaccurately given as file or memory management instead of peripheral management.

Question 2 (b) (i)

(b) A computer also has utility software.

(i) State the purpose of utility software in a computer.

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

The most common responses related to utility software being used to maintain the computer, or to perform housekeeping tasks. Some responses identified it as managing utilities or providing utilities which was insufficient to explain what a utility was and its purpose.

Some candidates gave specific examples of utility software and what this software did, for example defragmentation or encryption. These did not answer the question of the purpose of utility software in general, instead just the purpose of that one example of utility software.

Question 2 (b) (ii)

(ii) Explain the purpose **and** function of encryption software.

.....

.....

.....

.....

.....

..... [3]

Common responses included the use of a key to encrypt or decrypt the data. Some candidates identified that this key scrambled the data or turned it into cypher text.

Misconception



Encryption does not stop data from being intercepted and does not stop the data being read. The transmission of encrypted data can be intercepted and the datafile can be opened. However, the datafile will be meaningless and not make any sense. The data is still there, but mixed up by the key and the encryption algorithm.

Question 3*

- 3*** A company designs and builds tablet computers. The company wants to reduce the cost of manufacturing their tablet computers. The company also decides to stop releasing software updates for their older tablet computers. This means customers will need to change their devices more often.

Discuss the impact of these decisions on the company and the customers.

Include in your answer:

- ethical issues
- environmental issues
- benefits and drawbacks.

[8]

Many responses were suitably structured, with the stronger responses taking each of the bullet points in the question in turn. Some responses made appropriate use of bullet points and tabular structures, especially for the benefits and drawbacks which presented their arguments appropriately. When using bullets and tables candidates need to make sure they include their expansions alongside.

Candidates often focused on the drawbacks of the decision, most commonly the environmental impact of the waste generated from replacing devices. Similarly, many responses identified a potential increase in the digital divide. The most common argument was that people could not always afford to purchase new devices, and so would not have access to the most up-to-date technology..

Fewer responses considered a range of potential benefits beyond the increased profit for the company. Some stronger responses identified recycling the old devices to avoid waste, and providing these older devices at a lower cost to people who could not afford the newest devices.

Exemplar 1

By releasing software updates for their older tablet computers, meaning customers will need to change devices more often a negative impact on the environment happens because more waste is produced such as batteries and plastics that go into landfill and pollutes the planet. The company will generate greater profit from reducing the manufacturing cost and also forcing customers to purchase new devices more frequently. However, the company may lose business if the user decides that they dislike the ethics of the company polluting the planet. Business may also decrease if the customer isn't satisfied that their tablet computer is still good. The customer may feel unhappy that a new model has been released so soon. Reducing manufacturing costs is good as long as it's done ethically and doesn't take advantage of any workers or people in labour. Having a planned lifespan for a device is called planned obsolescence. Overall, the benefits are a greater profit and the company can dedicate more resources to developing new technology. However, the drawbacks are environmental damage, a worsening company reputation is possible, the risk of losing business

and the ethical implications of ensuring that manufacturing is carried out ethically and not taking advantage of less fortunate people.

In my opinion, I would advise against this change as the risks are very large and outweigh the potential positives for the company.

This candidate considers both the benefits and drawbacks. They identify the environmental drawbacks of extra pollution and that customers may not be happy at having to replace devices so often.

The response also considers the benefits of the company increasing their profits. This is expanded to explain how the profit can lead to more benefits, that they could put more resources into developing new technology.

This response gained the top band mark because they included ethical and environmental impacts. They gave benefits and drawbacks. The response had expansions; the candidate did more than stating a point, they explained why it was relevant, or how this was a drawback. They also considered both the customer and the company and how the decision would affect both.

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 bandwidth 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 slow 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.

Question 5 (a)

5

(a) Tick (✓) **one** box to identify the quantity of megabytes that is the same as 2 terabytes.

☐

2000 MB

☐

20 000 MB

☐

200 000 MB

☐

2 000 000 MB

[1]

Candidates were often able to correctly identify 2 000 000 as the correct response.

Question 5 (b)

- (b)** Each row in the table contains a number that is written as a denary value, 8-bit binary value and a 2-digit hexadecimal value. Some values are missing.

Complete the table by writing in the missing value for each number.

Denary	8-bit binary	2-digit hexadecimal
38		26
	01001110	4E
156	10011100	
215		D7

[4]

Candidates were often able to correctly convert the numbers between the different bases.

Question 5 (c)

(c) Complete the binary addition of these two 8-bit binary numbers.

Show your working out.

$$\begin{array}{r} 0\ 1\ 1\ 1\ 0\ 0\ 1\ 1 \\ +\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0 \\ \hline \end{array}$$

[2]

Candidates often gained the correct final answer. Some candidates did this by converting the binary numbers into denary and then converting the result back, which did not gain the working mark for binary addition. Some candidates did not include the final carry in their working, only showing two carries and writing the final carry direct into the position of the most significant bit.

Question 5 (d)

(d) Tick (✓) **one** box to identify the result of a 2-place right binary shift on the binary number 01110111.

☐ 00011101

☐ 11101110

☐ 00111011

☐ 11011100

[1]

Candidates were often able to correctly identify the result of the shift.

Question 5 (e)

(e) Describe the binary shift that can be used to multiply any number by 8.

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

Candidates commonly identified that a left shift was required. Fewer candidates identified the correct number of positions with common errors including four or eight positions.

Question 6 (a)

6 A computer uses the ASCII character set.

Part of the ASCII character set is shown here:

Character	Binary code
K	01001011
L	01001100
M	01001101
N	01001110

(a) Write the binary code to represent the word POP using ASCII.

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

Candidates were often able to correctly convert one of the characters into ASCII. Some candidates attempted to add together the binary values for the three characters to give one 8-bit value.

Question 6 (b)

(b) A new computer is being built.

Identify **one** benefit and **one** drawback of the computer using Unicode instead of ASCII.

Benefit

.....

Drawback

.....

[2]

Candidates were often able to identify that there were more characters in Unicode than ASCII. This was conveyed in a variety of ways, for example that more languages could be used, or by example such as Unicode allows for emojis.

Some candidates were also able to identify a drawback as it requires more memory or storage for the final file.

Some candidates inaccurately gave the reverse, thinking that Unicode had fewer bits and therefore less characters than ASCII.

Question 6 (c)

(c) The computer's CPU contains registers.

Complete the table by identifying **two** registers **and** state the purpose of each register.

Register	Purpose
.....	
.....	

[2]

Many candidates were able to identify registers that are in the CPU, most commonly the MAR and MDR. Some candidates inaccurately identified other components of the CPU such as the ALU and CU.

Candidates were often able to gain the mark for a description of the MDR. Some candidates inaccurately identified the MAR or the PC as storing data instead of the address of the data. Candidates who gave the accumulator sometimes gave a response that it stored the calculations instead of the result of the calculations.

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