

Examiners' Report

June 2025

GCSE Computer Science 1CP2 01

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June 2025

Publications Code 1CP2_01_2506_ER

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Introduction

This paper requires candidates to demonstrate and apply knowledge and understanding of key principles and concepts outlined in the specification content.

This is an untiered paper that has been specifically designed to allow candidates of all ability ranges to find questions that are both challenging and interesting throughout. The paper consists of five questions (with sub-questions), with each question focussed on a different specification topic, rather than aspects of several different topics. Questions in the paper are designed to be ramped so that later questions are more challenging.

Candidates will find that 'command words' are used consistently in the paper to indicate the type of response expected. Candidates who achieved high marks often provided more detailed responses, including examples and reasons, where expansions or explanations were required. Candidates should develop their use of subject-specific language and avoid giving generic responses, responding in the context of the question.

Question 1(a)ii

Most candidates responded correctly giving either 128 or 2^7 .

Some candidates gave 127 which is the largest number that can be represented with 7 bits, but is not the total number of unique representations.

(ii) State the number of unique values that can be represented with 7 bits.

(1)

64 32 16 8 4 2 1
64 112
32 120
96 124
16 126
112

127



This response scored 0 marks for an incorrect value. It was off-by-one exemplifying a typical candidate misconception giving the largest number that can be represented rather than the number of unique values.

Question 1(a)iii

Most candidates gave the correct ASCII code for G which was 71.

Question 1(b)i

Candidates sometimes confused the benefits of using hexadecimal with its characteristics, giving the benefits of using hexadecimal rather than focusing on its intrinsic characteristics. The characteristics are the features of the notation. Where candidates gave characteristics, they were sometimes too vague. For example, specifying 'letters' rather than 'letters A to F are used'.

Some candidates also stated that hexadecimal digits went from 1 to 9 instead of specifying from 0 to 9.

(b) Hexadecimal is used to represent memory addresses.

(i) Give **two** characteristics of hexadecimal notation.

(2)

1 ~~Use~~ Use numbers 1 to 9

2 ~~Use~~ Use letters A to F



This response scored 1 mark for stating that hexadecimal uses letters A to F. To gain the second mark the candidate would have needed to state that numbers/digits 0 to 9 are used as well, and not just 1 to 9.

Question 1(b)ii

Many candidates were able to identify a reason why programmers use hexadecimal notation such as that it is easier to read or write, but fewer were able to give the required linked explanation to give the reason for their assertion. A number of candidates wrote that hexadecimal took less storage space than binary which is incorrect - the amount of bits required to store the value is identical.

- (ii) Explain **one** reason why programmers use hexadecimal to specify memory addresses.

(2)

one reason why programmers use Hexadecimal is because it is easier for ~~other~~ other programmers to understand.



This response scored 1 mark for identifying that hexadecimal is easier to understand/use, but there was no expansion to give a reason to explain why this was the case for the second mark.

Question 1(c)i

Some candidates confused lossless compression with lossy compression. Many candidates were able to state that lossy compression would give higher compression ratios by removing data that would be outside the range of human hearing. Other popular reasons related to decreased file sizes for improved streaming by reducing download times.

(c) Audio and image files store data in binary.

(i) Explain **one** reason why lossy compression is used to reduce the size of an audio file.

(2)

it can be reduced more than if you used lossless ~~at~~ as some parts of the file are discarded



This response scored 2 marks without specifically relating to the context of lossy compression for audio. It did identify that lossy compression would achieve a higher compression ratio because some of the original data was discarded.

Question 1(c)ii

Most candidates scored at least one mark for multiplying the width (315) by the height (923) and many went on to give fully correct responses. Common errors included confusing the colour depth of 7 with 2^7 for the number of colours available and dividing by 1000 in an attempt to convert to KB rather than dividing by 8 to convert the total number of bits into bytes. A number of candidates also left one or more of the boxes empty rather than attempting to create a solution.

Question 1(d)ii

Candidates showed improved mathematical skills with the majority of candidates being able to convert an unsigned denary integer into binary. Some candidates converted the denary number 25 to the binary pattern 11001 rather than the 8-bit binary pattern 0001 1001, so scored one mark because they gave one correct nibble rather than two correct nibbles.

(ii) Convert the denary number 25 to 8-bit binary.

$$\begin{array}{r} 10+ \\ 8 \\ \hline 24 \\ 1+ \\ \hline 25 \end{array}$$

(2)

5k 32 16 8 4 2 1
0 0 1 1 0 0 1

0011001



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This response scored 1 mark. The response was not a full 8-bit binary number, but the right hand nibble could be identified to score a mark.

Question 1(d)iii

Fewer candidates were able to convert a negative denary integer into an 8-bit binary number using two's complement compared to a positive number conversion in d(ii). Where candidates attempted the conversion and produced incorrect responses, it was often because they tried to do the conversion by writing the positive value for -13 which was 0000 1101 and then flipping the bits to give 1111 0010, but then forgetting to add one. Many candidates also wrote out a number line starting with -128 for the most significant bit and then successfully completed the conversion using that technique.

(iii) Convert the denary number -13 to 8-bit binary using two's complement.

(2)

13 = 0 0 0 0 1 1 0 1
flip = 1 1 1 1 0 0 1 0
+ 1 = 1 1 1 1 0 0 1 1

-13 = 1 1 1 1 0 0 1 1



This response scored 2 marks for a correct answer. It exemplified the method of flipping the bits and adding one to convert between positive and negative representations of numbers using two's complement.

Question 2(a)

Many candidates gave vague responses or copied labels from the photo stimulus given in the question such as 'wash temp'. This did not give the function of the related embedded system which was to monitor the water temperature until it reached the required temperature. In general, responses needed to be more specific as to what was being controlled.

Give **two** functions embedded systems perform in a washing machine.

(2)

1 Cold wash

2 Extra Rinse



This response scored 0 marks. It copied labels from the photograph in the question without identifying specific control systems that would be used.

Question 2(b)i

Many candidates identified reasons for using non-volatile storage such as storing the BIOS or storing programs/data permanently. Where candidates drew comparisons between volatile storage, and RAM in particular, they were awarded a mark for a valid comparison such as higher storage capacity.

(b) Computers use different types of storage.

(i) Non-volatile storage keeps its content when the power is turned off.

Give **one other** reason why computers use non-volatile storage.

(1)

To store the bootstrap that helps start the computer.



This response gained 1 mark for identifying that non-volatile storage is often used to store the BIOS/bootstrap sequence.

Question 2(b)ii

Most candidates identified optical storage media as the correct response.

Question 2(c)i

Many candidates were able to state that an interpreter translates high-level source code one line at a time, but fewer were able to identify a second point such as code is executed immediately after translation. A number of candidates confused interpretation with compilation and wrote that the source code was translated into machine code.

(c) Programmers write code.

(i) Describe how an interpreter translates high-level code.

(2)

*it translates ^{the code} line by line into
assembly*



This response scored 1 mark for identifying that interpreters translate source code line-by-line. It did not go on to expand upon this point to form a linked description.

Question 2(c)ii

Some candidates confused characteristics with benefits and drawbacks and erroneously gave responses that compared writing code in assembly language with writing code in a high level language. Where candidates did list characteristics of assembly language, they frequently cited that mnemonics were used (although often spelt incorrectly) to represent instructions and that assembly was architecture specific.

(ii) Assembly language is a low-level programming language.

Give **two** characteristics of assembly language.

(2)

1 It uses mnemonics

2 It ~~uses binary~~ is harder to understand than high level code, but easier than machine code



This response scored 1 mark for identifying that assembly language uses mnemonics. It did not gain a mark for the second point made because that is a drawback of using assembly language rather than a characteristic.

Question 2(c)iii

Audit trail was commonly identified correctly.

Question 2(d)

Most candidates struggled with the concept of virtual memory and how it is used in process management. The need to understand how virtual memory is used in process management is flagged in the Getting Started Guide. Many candidates' responses were vague and alluded to the use of virtual memory when main memory ran out. Few candidates were able to accurately describe how inactive processes could be temporarily moved out of RAM to secondary storage to free up space in RAM until such time as they were required again. A common misconception was to confuse virtual storage with cloud storage.

(d) One role of the operating system is to allocate memory to processes.

Describe how the operating system makes use of virtual memory when there is a shortage of main memory.

(2)

The operating system converts part of the secondary storage into virtual memory and any processes currently not in need move from the ^{main} memory to virtual memory and any process which are needed are moved from virtual memory to the main memory (thereby using the resources shortage of main memory ~~efficiently~~ ^{effectively}).



This response scored 2 marks for clearly identifying that processes not currently being used can be transferred from RAM to secondary storage to free up RAM for other processes to use and then retrieved from the virtual memory when required.

Question 2(e)

Whilst some candidates gave clear explanations that file repair utility software is used to retrieve data from corrupted files, many candidates gave very vague answers. Stating that file repair software is used to repair files was not creditworthy.

(e) File repair is a type of utility software.

Explain **one** reason why file repair software is needed.

(2)

In case a file is corrupted

Previous versions of it can help restore the original file



This response scored 1 mark for the initial identification of using file repair software when a file is corrupted. However, the next sentence referred to backup software for previous versions and not file repair software to retrieve content from corrupted files.

Question 2(f)

Most candidates correctly identified a number of the labels on the microprocessor diagram. Common errors included stating CPU instead of CU for Label A or being too vague and saying 'bus' or 'memory bus' instead of 'address bus' for Label B.

Identification of the clock for Label C was the least well answered part of the question.

Question 3(a)ii

Most candidates demonstrated at least some knowledge of the principles of data protection, either giving the responsibilities of companies holding and processing data or the rights of individuals. The most commonly cited data protection principle was the need to gain consent to collect data.

(ii) One principle of data protection legislation is that data must be processed lawfully, fairly and in a transparent manner.

Give **three other** principles of data protection legislation.

(3)

- 1 Data must be held securely
- 2 A data subject can request for the removal of personal data at any time
- 3 Data must be relevant to the purpose of collection



This response gained all 3 marks, covering both the rights of individuals and the responsibilities of companies.

Question 3(b)

A number of responses were too general to be awarded credit. Statements such as 'anyone can use it' or 'anyone can access it' could equally apply to free software where the source code is not made available. Good responses made it clear that it was the source code that could be accessed/edited.

(b) Software licensed as open-source can be used free of charge.

Give **one other** characteristic of open-source software licensing.

can be used by anyone



This response gained 0 marks because it was too vague. Anyone can use any software if they pay for it. Anyone can use 'free' software. It was not clear that the source code was freely available to anyone.

Question 3(c)i

Many candidates gave clear explanations using examples of recommended or banned actions that could appear in an AUP alongside resultant consequences and reasons. Some candidates confused acceptable usage policies with cyber security and the need for malware protection or confused it with access controls or monitoring programs. This showed a misunderstanding between policy to influence behaviour and automated technological systems to stop unwanted actions.

(c) Cyber security protects computer systems from harm.

(i) Explain **one** reason why an acceptable use policy keeps computer systems secure.

(2)

It prevents people with unauthorised access to misuse the systems to access data for personal use



This response scored 0 marks because it confused access controls with acceptable usage policies.

Question 4(a)

Nearly all candidates correctly identified WAN as the correct response.

Question 4(b)

Whilst most candidates achieved at least one mark, relatively few achieved all three marks. Many candidates wrote IP instead of TCP/IP. IP on its own does not establish an end-to-end connection between two computers on a network.

Question 4(c)

Most candidates were able to identify at least one role or aspect of an ethical hacker's involvement in network security. Some responses were vague and limited being of the form that ethical hackers 'hack networks' without specifying what this actually meant. Clearer responses indicated that penetration testing was performed to try to gain access to systems. Whilst there were a wide range of potential points that could be made, fewer candidates were able to give three separate points. A common misconception was that ethical hackers retaliate against malicious actions 'hacking them back' instead of testing for vulnerabilities.

(c) Describe the role of an ethical hacker in network security.

(3)

An ethical hacker is a hacker hired to attempt to hack into a network. They are used in network security to locate any weaknesses in a network security system.



This response scored 2 marks for identifying that ethical hackers can be hired by a company and that they try to find weaknesses in systems. 'Hacking into a network' was often seen and was regarded as too vague, because it did not state that this means trying to gain access to systems/networks. This response could have achieved a third mark if it had gone on to say that weaknesses are reported on so that they can be patched/fixed.

Question 4(d)

Most candidates attempted the essay question and could either comment on transmission media or topology. Transmission media was more commonly omitted from responses than topology. For topology, some candidates erroneously diverged into talking about LANs and WANs. Fewer candidates were able to discuss both transmission media and topology, and this was required to access Level 3 marks. Some candidates continued to discuss ring topologies, but it should be noted that this is not a topic covered in the specification.

(d) A business employs 20 people.

Each employee has a laptop.

The business is relocating to a new office building.

Employees need to access resources and connect to the internet.

laptop - files & resources
communicate

WAN - resources

Discuss the type of network the business should install in its new building.

Your answer should consider:

• transmission media

• network topology.

fibre op ~~frequency~~ reliable
wifi - portable

~~point~~ x bus
x star

full mesh

You do not need to consider cost of materials or installation.

The business would need to install ^{have access to} a WAN ⁽⁶⁾ ~~wide area network~~. They need to do this because they require access to the resources on the Internet, and on the servers of the old building - as it's over a large area - ~~definition~~ ^{of a WAN} network: geographically. To do this, they would use hardware leased by a telecommunications company to transmit data. The transmission media would be fibre-optic cables - as they are ~~for~~ much faster than copper cable, and reliable compared to a ~~wireless~~ ^{wifi} protocol which would have too short of a range also. However, to access resources ^{within} ~~inside~~ the company, they would require a LAN - a local area network, ^{as} ~~for~~ the area is a relatively small geographical ~~area~~ ^{area} inside their new office. To transmit data, Wifi should

be used - as although it can be unreliable at times, it allows for the laptops to be portable and allows the employees to take their laptops home and work from home if need be, increasing job satisfaction, compared to an Ethernet UTP copper cable - although data will be transmitted faster, ~~they~~ ~~the~~ laptops will be unable to move, making it hard to access resources from home that are saved on the laptop, as well as you are unable to work in other office locations.

The LAN would also be used for computers to share files and peripherals, for example, printers. The topology that should be used is ^{star} ~~full mesh~~.

(Total for Question 4 = 13 marks)

This is because the devices are all connected to ~~each~~ the switch, and it works with wireless - eg, WiFi protocols, although there is an overreliance on the switch. Multiple devices can be connected ~~without~~ ^{without} collision, and if one wire breaks, all other devices remain connected. This contrasts with the worse bus topology, where if the ~~main~~ wire (main) breaks, all devices lose connection, there is a high collision rate with multiple devices, and it's less secure.



This response is an example of a Level 3 answer that covered both the transmission media and the network topology in depth. It drew out the benefits and drawbacks of different media and topologies and made recommendations.

The response was very detailed and scored 6 marks.

Question 5(a)

Many candidates found it difficult to derive the correct expressions for S and T in the truth table. Where candidates struggled to derive the expressions, they were often able to complete the actual truth table values.

Question 5(b)i

Most candidates attempted this question, but relatively few could identify both lines of code that were required.

Question 5(b)ii

Many candidates who attempted most of Q5 were able to identify the correct expression, but there were many candidates who omitted a response to this question.

Question 5(c)

It was encouraging to see many candidates attempt the trace table at this stage in the paper. When candidates attempted the question, it was noticeable that many iterated the loop too many times and traced *number* from 1 to 7. Remainders were more accurately given in rows 1 to 3 where numbers divided exactly, but in rows 4 to 6 more errors occurred. Some candidates gave outputs on each line rather than giving the final output which would only be printed at the end of the algorithm.

Complete the trace table.

You may not need to fill in all the rows in the table.

(4)

number	remainder	total	Output
		0	
1	0	1	
2	0	3	
3	0	6	
4	2		
5	1		
6	0	12	
7	-1		
			12



This response scored 3 marks.

It did not get mark point 1 because it iterated numbers from 1 to 7 instead of 1 to 6. It did get mark points 2 and 3 for correctly tracing the intervening rows. It also achieved mark point 4 for giving the final output of 12 once only at the end.

Question 5(d)i

Whilst many candidates identified that the worst case for a linear search was when the item to locate was either the last item or not in the list, fewer were able to give the reason for this.

(d) The efficiency of algorithms can be analysed.

The worst case is when the most comparisons are required.

The best case is when the fewest comparisons are required.

(i) Explain the worst case for a linear search on an array.

When the result is the ^{final} ~~last~~ item in the list so it checks ~~through~~ ^{every} item to have the maximum amount of comparisons. (2)



This response scored 2 marks for giving a clear linked explanation that justified the worst case being that the item was the last in the list because all preceding items had to be compared first.

Question 5(d)ii

Answers to this question tended to mirror Q5d(i) with many identifying that the best case for a bubble sort was when the data was already in order. Fewer were able to give the reason for this. Many candidates reiterated the wording of the question stating that the best case was when the fewest comparisons were needed. Responses that reiterated the question were not creditworthy.

(ii) Explain the best case for a bubble sort on an array.

(2)

The best case is that it only needs
one pass to be in order.



This response scored 1 mark for stating that the best case was when the list was already in order, but there was no linked explanation to explain why this was the case.

Question 5(e)

Encouragingly, most candidates attempted the last question on the paper. Many achieved the first mark or two for tracing the initialisation of the start and end index and stating whether the item was found or not. Fewer were then able to update the start/end indexes correctly to reflect the part of the list that would be discarded and fewer still were able to trace the algorithm to the point when the algorithm would stop. Another common error was to continue to include the midpoint rather than discarding it when deciding on the bounds for the new sublist.

Start index	End index	Calculation of mid-point	Found Y or N	Discard lower, higher or none
[0]	[10]	$(0+10) \div 2 = [5]$	N	discard lower
[5]	[10]	$(5+10) \div 2 = 7.5 \rightarrow [8]$	N	discard higher
[8]	[6]	$(8+6) \div 2 = 7 [7]$	N	discard higher
[7]	[6]	$(7+6) \div 2 = [6.5] \rightarrow [6]$	N	discard none.
				



This response, like many, scored the first 3 marks.

Where candidates had an idea as to how a binary search calculated a midpoint and then discarded the half of the list that did not contain the target item, they scored 3 marks. More detailed knowledge of the specific way in which the upper/lower bounds are updated in a binary search was required to update the start/end indexes accurately to continue the algorithm.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Learn and use clear definitions for technical terms within the specification.
- Read and interpret the question prompt to focus on the specific requirements and provide more relevant responses that address the critical aspects of the question.
- Where a context or scenario is provided, respond by using the contextual information in the question.
- Expand and explain answers using examples and reasons, especially where more than a simple statement or list is requested.
- Understand that characteristics are properties or features.
- Clarify understanding of the differences between high and low level languages.
- Develop clear understanding between the difference between different searching and sorting algorithms.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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