



# Examiners' Report Principal Examiner Feedback

Summer 2023

Pearson Edexcel GCSE  
In Computer Science (1CP2) Paper 1

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## **Introduction**

This is the second time that students have taken examinations for this paper, which requires them 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 students 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.

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

### Question 1bii

Some students understood methods of source code translation, referring to it in different ways, e.g. interpreter/compiler. A common mistake was referring to 'translation', which was in the question. Some students incorrectly used terms such as code, hex, binary, ascii.

|   |     |
|---|-----|
| (ii) State <b>two</b> methods of source code translation. | (2) |
| 1 ..... interpreters                                      |     |
| 2 ..... compilers   |     |

This response scored 2 marks.

### Question 1d

Many students showed an understanding of the idea that an embedded system is a (small) system contained within another system or one that performs a specific or dedicated task.

|  |     |
|--|-----|
| (d) Define the term 'embedded system'.   | (1) |
| <i>A system within a device that is usually separate from a network. E.g. microwave heating options.</i> |     |

This response scored 1 mark for 'system within a device'.

### Question 1e

Adds time and human error were the most common answers for the first part and many got the second part incorrect by stating something to do with algorithmic bias, or mentioned logic errors.

(e) A code review is carried out by a programmer or an automated system.

Both methods cost money.

Complete the table with **one other disadvantage** for each method.

(2)

| Method of code review  | Disadvantage                                  |
|------------------------|---|
| By a programmer        | Takes longer to complete                      |
| By an automated system | may not spot all errors <del>made</del> made. |

This response scored 2 marks; 1 mark for 'takes longer' and another mark for 'may not spot all errors'.

(e) A code review is carried out by a programmer or an automated system.

Both methods cost money.

Complete the table with **one other disadvantage** for each method.

(2)

| Method of code review  | Disadvantage  |
|------------------------|---|
| By a programmer        | could misread<br>code                                     |
| By an automated system | <del>doesn't help to fix<br/>it in fix</del><br>unethical |

The first response is an example of human error, so mark point is implied, 1 mark.

### Question 1gi

Many students gained the mark for referring to scheduling or priority order, but few responses linked these together for two marks. Many mentioned multitasking or the fetch decode and execute cycle, and buses, rather than answering the question. Students sometimes effectively talked about the management of tasks and allocating system resources.

### Question 1gii

There was a good spread in terms of the options chosen for students' responses out of the possible functions of the operating system. However, the use of the terms 'control' and 'organise' were used for files, but without expanding on them to provide context.

(ii) Give **one other** function of an operating system. (1)

Peripheral management: controlling peripheral devices which are connected to the ~~the~~ computer.

This response scored 1 mark for 'peripheral management'.

### Question 2a

Students could either complete the first two layers correctly or not identify either of the layers. There were a wide range of unrelated responses that showed a lack of understanding of the layers.

**2 Networks**

(a) Complete the diagram of the 4-layer TCP/IP model. (2)

```
graph TD; A[Application] --> B[Data]; B --> C[Internet]; C --> D[Link];
```

This response scored 1 mark for 'Application'.

## Question 2e

Many responses stated that IMAP allows emails to be accessed from multiple locations instead of multiple devices, thereby confusing IMAP with networking. A number of responses made reference to speed of access and security, which were not relevant to the question.

(e) Explain **one** benefit to a user of using IMAP to access emails. (2)

IMAP does not delete emails unless purposely removed of the system. This allows people to access emails on different devices and the same data be there.

This response scored 2 marks. 1 mark for 'unless purposely removed' and another mark for 'allows people to access emails on different devices'.

## Question 2f

Many students highlighted the use of locked doors as a suitable method of physical security. Some referenced CCTV, despite it being in the question. Those who only gained one mark did not make it clear that unauthorised users would be prevented. A few responses mistakenly identified protection such as firewalls, which did not directly address the question's focus on physical security. While their responses demonstrated some knowledge, they needed to be aligned with the specific requirements of the question.

(f) A factory has two file servers installed in an office.  
A closed-circuit television system monitors the factory.  
Explain **one other** method of physical security that could be used to protect the servers. (2)

Alarms as it will automatically alert if an intruder has gained unauthorised access.

This response scored 2 marks.

## Question 2g

Most responses suggested some knowledge of bandwidth, but students did not identify that it is the maximum amount of data that could be transmitted at a given point in time. Most students who did not gain full marks did not refer to maximum data capacity. Some responses referred to 'bandwidth' in terms of distance/range.

(g) Network speed is the current rate of data transmission, measured in bits per second.

Define the term 'bandwidth'.

(1)

the maximum possible number of bits which can travel through a network at any ~~give~~ given ~~sub~~ moment.

This response scored 1 mark for 'The maximum possible number of bits'.

(g) Network speed is the current rate of data transmission, measured in bits per second.

Define the term 'bandwidth'.

(1)

The speed at which a device can transfer data, its ~~or~~ ~~can~~ its capability to do so.

This response scored 0 marks.

## Question 2h

Students often described the process of what happens when data travels through the network but not how (i.e. packet switching). Many were able to identify that the data travelled through the router and concentrated on what it does rather than how it gets there. Many key words were used, including IP address, but MAC was also used in descriptions of the process. At other levels, students had described the packet switching process in detail including checksum processes, clearly showing their level of knowledge and understanding.

There was some evidence that students were recalling a model answer from a similar question on a previous paper.

(h) High-speed fibre-optic cables form the internet backbone. Routers connect other networks to this backbone.

Describe how a router enables data to arrive at its destination.

(2)

A router will receive a data packet and will calculate which its pathway through different routers ~~the~~ (sending all the packets to different routers) until it reaches ~~reaches~~ its destination ~~it~~ through pathways with less internet traffic.

This response scored 2 marks. 1 mark for 'calculate its (the data packet's) pathway' and the other mark for 'will receive a data packet ... sending all the packets to different routers'. This was enough to imply packets received and then sent **to the next router** (mark point 3). The implication that data is sent to another router was required for this mark point.

### Question 3a

The idea of worms self-replicating was the main correct response provided by students. Lots of incorrect responses were mostly confusing worms with a virus.

#### 3 Issues and impact

(a) Computer worms are a type of malware.

Describe **one** way that a worm can move from machine to machine.

(2)

worms replicate and make more and more copies of itself ~~to transfer~~ that can move from machine to machine, such as files being sent that are corrupted by worms.

'Worms replicate and make more and more copies of itself', scored 1 mark. A second mark was not awarded as there is no correct reference to how worms move (worms do not require a host file in the same way a 'trojan' virus does).

#### 3 Issues and impact

(a) Computer worms are a type of malware.

Describe **one** way that a worm can move from machine to machine.

(2)

It can pass through emails and other devices ~~that~~ that connect or through the network

This response also scored 1 mark.

### Question 3c

Many responses were related to weather, but only few made references to extreme weather events. This meant that marks could not be awarded for this alone.

(c) Computer programs control some aeroplane landings.

Explain **one** reason computers are **not** capable of safely controlling all aeroplane landings.

(2)

Computers ~~cannot~~ may not be able to act if there is an emergency as it is not coded specifically enough and it goes beyond what it has been run to do. The dataset provided cannot account for emergency landings and the user may need to bypass the rules for this reason.

This response score 2 marks; 1 mark for 'may not be able to act if there is an emergency' and 1 mark for 'and it is not coded specifically enough'.

### Question 3d

Many responses correctly identified that the rivers would be polluted or showed understanding that the scarcity of water due to use in chip manufacturing would impact the environment. However, responses on how this would affect the environment was rather mixed. For example, there were lots of responses mentioning drought as a major impact of using large amounts of water to manufacture chips.

(d) Large amounts of water are used to manufacture computer chips.  
Describe **one** way this impacts the environment. (2)

This could pollute the rivers and get  
in drinking water

This response scored 2 marks. 1 mark for 'this could pollute the rivers' and 1 mark for 'get in drinking water', as this implies posing a risk to people.

### Question 3e

The most common response from box 1 was misuse / unauthorised access. Many responses mentioned consent and privacy for box 2.

### Question 4a

While some responses achieved both marks for a well-linked explanation, there were many that got trace tables confused with truth tables. Most correct responses mentioned that they are used to check the correct output, or test for bugs, but failed often to explain how, omitting the fact that a trace table tracks variables.

**4 Computational thinking**

(a) Programmers use trace tables with algorithms.  
Explain the purpose of a trace table. (2)

They provide a step by step list of the state of  
inputs, outputs and variables after each line of code is executed.  
This helps programmers find logic errors.

This response scored 2 marks. 'They provide .... the state of ... variables' gained the first mark and ' helps programmers find logic errors' gained the second mark.

### Question 4b

Lots of responses described storage or a storage method, rather than a data structure.

(b) Algorithms use arrays and records to hold data.  
Describe a record. (2)

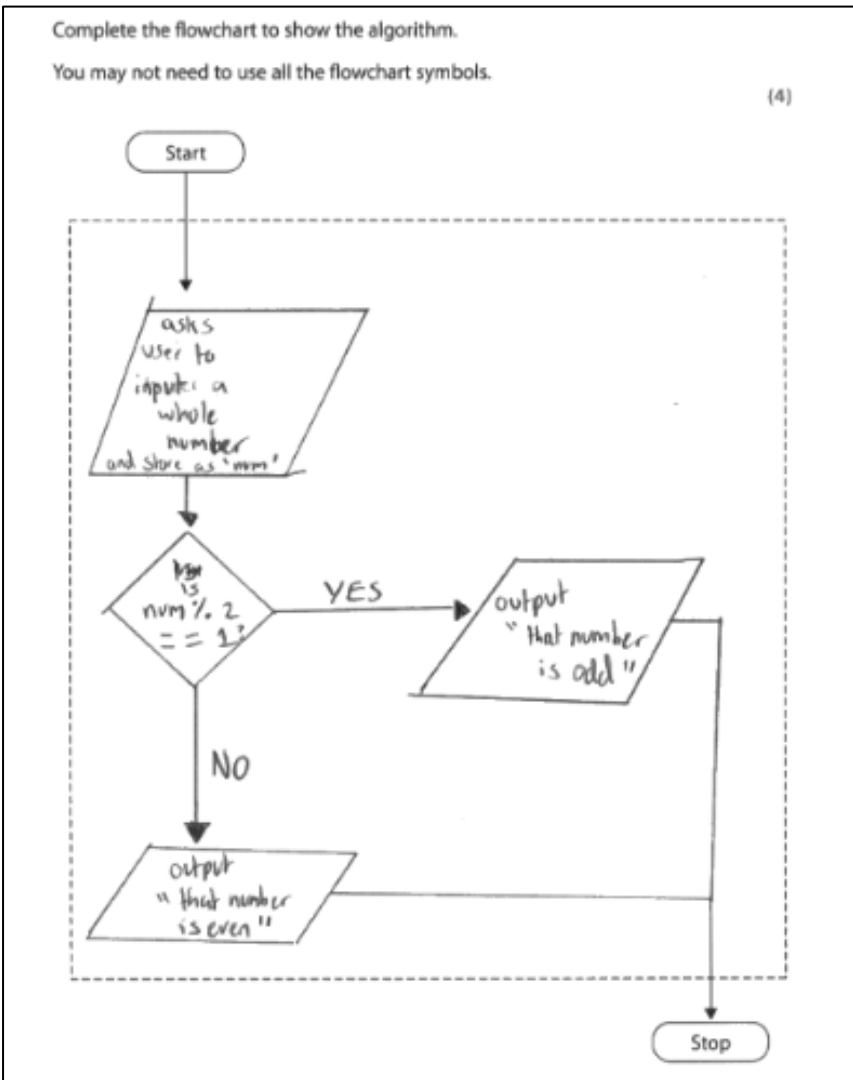
A record can store multiple items or elements of the same or different data types under the same name or identifier.

This response scored 2 marks; 1 mark for 'can store multiple items or elements' and 1 mark for 'different data types'.

### Question 4c

Most responses correctly used the appropriate input symbol and had two outcomes from the decision. They understood the necessity of evaluating conditions and making choices based on them. Some students struggled to comprehend the relational test involving MOD, instead focusing on DIV, or whether the value divided by 2 had a remainder. Despite this, many students could make appropriate connections to the terminator and include at least one output message relevant to the decision outcome.

A few students used a decision shape instead of an output shape.



This response scored all 4 marks.

#### Question 4d

Some responses methodically outlined the steps of the algorithm. However, the final mark point awarded for when the item is not found so the algorithm stops and the explicit point of comparing the item with the target were the most frequently missed marks. Many responses deviated from the intended focus by discussing sort algorithms.

(d) A linear search algorithm can be used on both a sorted and an unsorted array.  
Describe how a linear search algorithm operates on an **unsorted** array.

(4)

It iterates on every value of an unsorted array and for every value checks if the value is equal to the value being searched for. If not, it will continue to the next variable until it does. If it reaches the end of the list and the value has not been found, it will declare that there is no such value.

This response scored 4 marks. 'iterates' 1 mark, 'checks if the value is equal to the value being searched for' 1 mark, 'if not, it will continue until it [is equal to the value being searched for]' 1 mark and 'If it reaches the end of the list and the value has not been found' 1 mark.


#### Question 4e

A number of responses used ticks and crosses instead of 0, 1 etc. In general, students fully understood the logic process.

#### Question 4f

Despite being given bullet points to cover, many students did not use the structure of the question to compile their answer. Many cited vague benefits and although the definition for abstraction was often given, students were not clear on its benefits or its use. For example: some students thought abstraction would save on file size if a simplified character was used, while others talked about using or simplified maze, because they would be easier to navigate.

(f) A group of students are working together on a single maze game. The arrow keys control the character. When the character reaches the end of the maze without touching a wall, a happy sound is played. The game also displays a score.



Discuss the use of decomposition and abstraction in developing this game.

Your answer should include:

- a definition of each term
- the benefits each brings to the group of students
- an example of where each could appear in the program code.

(6)

Decomposition -  
To break down a larger problem into step by step smaller sub problems.

Abstraction -  
The removal of unnecessary detail leaving only whats important.

The student can use decomposition to help in building the code such as by breaking down ~~the~~ breaking down the construction of the maze into making coding the walls and another student can work on ~~any~~ and effects. This will ~~be~~ reduce the amount of work each student has and the time taken to work on the project will go down as students are doing different things.

The student can use abstraction by removing unnecessary details. This can be such as the code using a while loop while making the program and not ~~reusing the same~~ reusing the same code or not adding a timer. This makes the code easier to read and understand. While completing the task more efficiently.

This response scored 3 marks. Both aspects are defined, and links are made to the benefits of decomposition. The benefits of abstraction are unclear.

Responses did not have to give the benefits of both, but if only one, the benefits of that one needed to be well-developed.

decomposition is breaking down a problem into smaller tasks that are more manageable. Abstraction is ignoring or hiding unnecessary information so you can focus on ~~the most important things~~. More important things decomposition could help the students as they could separate the tasks between them so they can complete the game faster. For example one student ~~could~~ could work on how the character moves and is controlled and another can work on how collisions with ~~the walls~~ <sup>the walls</sup> are handled.

Abstraction could be used to separate and focus on the most important tasks and isolate those which ~~can be~~ can be included later. This benefits the students as the more important parts of the game will be finished earlier. ~~For example~~ <sup>an</sup> example would be to make sure the character can move and that ~~the~~ the game is playable.

before adding secondary things like a main menu or the score

decomposition helps with how the tasks to complete are handled so it can help to finish the game more quickly, while abstraction can help to happen later which makes it more in context and should be tackled next.

Using these concepts

It helps to polish and better tackle the development of the game as they can know what to do first how to divide their time and what requires their immediate attention.

This response scored 4 marks. The response defines decomposition and abstraction and mentions some benefits to the group of students. However, there is some repetition of points made and no reference to the program code.

If a response only defined the terms, it can be no more than Level 1. For Level 2, the response had to provide benefits to the students - the definitions may have been implied.

For Level 3, a response had to provide at least one example of where decomposition or abstraction can appear in the program code. It is likely that a good example of either was enough to gain full marks, as long as the [possibly implied] definitions and benefits were also there.

### Question 5a

Many students showed a good understanding of lossy compression, particularly with regards to permanent data loss. Some went as far as comparing with lossless. The use of examples that could describe how data loss affects file quality was not always well explained.

**5 Data**

(a) Describe **one** effect of using lossy compression to reduce the size of a file. (2)

The file size will be significantly ~~the~~ smaller because many unnecessary data will be removed like colours and frequencies humans cannot notice

This response scored 2 marks.

## 5 Data

(a) Describe **one** effect of using lossy compression to reduce the size of a file.

(2)

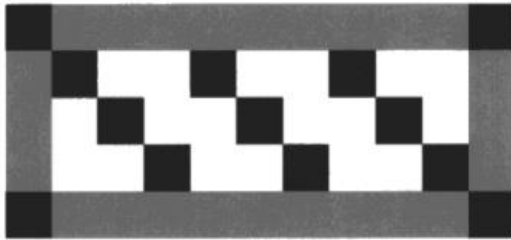
An effect of using lossy compression is that it will make file transmission faster leading to being able to send ~~more~~ more files faster and efficiently.

This response scored 0 marks.

## Question 5b

Some responses showed good understanding of how an image is constructed and how the number of colours impacted the number of bits required for the colour depth of the image, while a lot of responses thought the question was about resolution and thought that the image was not clear because 1-bit resolution was too low.

(b) Here is an original image.



There is one bit available to represent each pixel.

Explain **one** reason why the image cannot be accurately represented using one bit for each pixel.

(2)

only  $2^1$  (2) colours can be represented with a color depth of 1 so it will be in black and white, whereas this original image portrays black, grey and white (3 colors) which would need at least 2 bits to represent as 1 only shows black and white

This response scored 2 marks. 1 mark for 'colours can be represented' and 1 mark for 'so it will be in black and white'.

## Question 5c

Lots of confusion around this question with some students knowing what a logical shift was, but many struggled with arithmetic shifts. Many students did not reference the most significant bit in their responses.

(c) Shifts are performed on binary patterns.

A **logical** shift right is performed on a pattern.

An **arithmetic** shift right is performed on the same original pattern.

Describe the reason the results will be different.

(2)

Logic shifts right replace blank spaces the MSB with a 0, whereas Arithmetic shifts copy the MSB to use for the new MSB

(c) Shifts are performed on binary patterns.

A **logical** shift right is performed on a pattern.

An **arithmetic** shift right is performed on the same original pattern.

Describe the reason the results will be different.

(2)

because logical shift will replace the value on the far most left with 0 and arithmetic will replace it with the value it lost.

These responses scored 2 marks.

### Question Q5eii

A number of responses did not set out the expression accurately, or show understanding the arithmetic process required. Generally, at least one mark was awarded for  $100 \times 600$ . There were still some misconceptions around converting into bytes. In many instances the +1024 was included in the numerator, rather than being applied to the whole expression.

(ii) A file format uses a  $100 \times 600$  table of 32-bit integers.

The file uses 1 kibibyte of additional data.

Construct an expression to show the number of **bytes** of storage needed to store the file.

(3)

$$100 \times 600 \times 32 + 1024$$

This response scored 2 marks.

### Question 5f

Students did not always label the axes correctly, especially the y axis. It was often the case that not all points were accurately plotted. Very few students produced a square wave and some students stopped plotting at point 9 rather than point 10. Some students mistakenly flipped the two's complement values, leading to incorrect amplitudes in their representation, others gave amplitude values from 0 to 1 to 15, instead of -1 to 0 to 1.

(f) An analogue sound is represented in digital form.

The sound is one second long and is sampled at 10Hz.

The digital representation has a bit depth of 5 and is stored in two's complement.

**Sound data:**

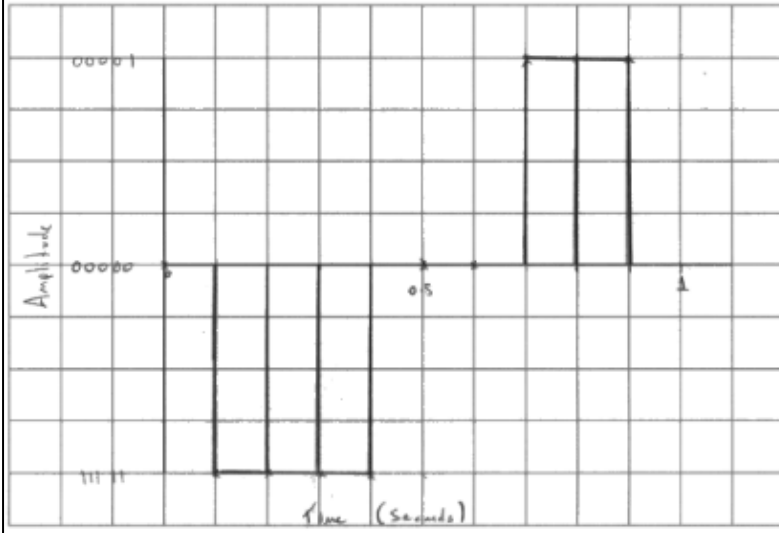
```
00000 11111 11111 11111 11111
      -1
00000 00000 00001 00001 00001
```

Draw a graph to represent the data sampled.

You must include:

- labels for the x and y axes
- values for the x and y axes
- each sample plotted as an X
- samples joined up to show the digital form.

(6)



This response scored 6 marks. X-axis labelled correctly, 1 mark. Y-axis labelled correctly, 1 mark. Value of X-axis as 0 and 1, 1 mark. Binary values on y axis, 1 mark. All 10 values plotted to correct points (starting from 0), 1 mark. Points join to form a square wave, 1 mark.

## Paper Summary

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

- Expand and explain answers using examples and reasons, especially where more than a simple statement or list is requested.
- Where a context or scenario is provided, respond with the context of the question in mind.
- 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.
- Develop a clear understanding of data representation, e.g. the number of states that can be represented with 1 bit and focus on understanding the key elements of representing analogue and digital signals.
- Familiarise yourself with the appropriate symbols and conditions to ensure clarity and accuracy in diagrammatic representations of algorithms.