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Examiners' Report
June 2024

GCSE Computer Science 1CP2 01

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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.

Candidates will find that 'command words' are used consistently in the paper to indicate the type of response expected. High mark responses were often more detailed, 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 (b)

Many candidates demonstrated a good knowledge of the benefits of subprograms. Most answers related to code being written once or subprograms being easier to debug. Occasionally answers were an unqualified 'easier' or 'quicker' rather than a qualified example such as 'easier to debug'.

(b) State **two benefits** of subprograms.

(2)

1 They seperate a problem into different parts, creating better readibility (makes problem simpler).

2 Allow for each seperate line 'block' to be debugged individually, making it easier to debug.

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This response scores 2 marks for stating improved code readability and then making code easier to test and debug.

Question 1 (c)(i)

Most candidates were able to correctly identify the line where a conditional loop started.

Question 1 (c)(ii)

Fewer candidates could identify an example of iteration compared to a conditional loop in the previous question. The most common mistake was not identifying the entire selection process and instead only listing the IF command on line 16.

Question 1 (c)(iii)

Many candidates were unable to identify selection or gave just 16 rather than the full range of lines that contained the selection.

Question 1 (d)(i)

Many candidates gave definitions that were vague or ambiguous. Stating spelling mistakes or mistakes in grammar in isolation is insufficient, and candidates need to make it clear that a syntax error means that the rules of a programming language have been broken. Candidates are required to give accurate technical definitions. Some confused syntax errors with logic or runtime errors, or gave ambiguous responses that could equally have applied to other categories of error. Where candidates gave examples of syntax errors they did not answer the question as they need to provide a definition and not an example.

(d) Programs can have syntax errors and runtime errors.

(i) Define the term 'syntax error'.

(1)

an error caused when the rules of a programming language are not followed.

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Examiner Comments

This response scores 1 mark for defining that the rules of the programming language have not been followed.

Question 1 (d)(ii)

Many candidates confused a runtime error with a syntax error stopping execution of an interpreted program. A number of candidates erroneously thought that a runtime error meant that the computer had insufficient time to complete the execution of the program or that it took too long to run. Some candidates gained partial credit for identifying that the program would crash, but were then unable to give the reason why. An identification of a potential cause of a runtime error such as division by zero is not enough as an expansion. Candidates need to explain that such operations cannot be executed and that is why the error occurs.

(ii) Runtime errors happen when a program is executing.

Explain a runtime error.

(2)

Runtime errors occur when the computer is asked to perform an impossible task, such as dividing by zero or opening a non-existent file. They usually result in crashes, because the computer is unable to perform the task.

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Examiner Comments

This response scores 2 marks for explaining that the computer will crash when it is asked to do an impossible task.

Question 1 (e)(i)

Candidates either tended to score 2 marks for knowing that a condition evaluates to a Boolean value of True/False or scored 0. A number of candidates erroneously described the greater than relational operator, or gave the output as yes/no rather than as a Boolean.

Question 1 (f)(i)

Many candidates identified the correct search and sort algorithm. Where candidates did not understand the term 'divide and conquer' they often cited linear search or merge sort which were incorrect responses.

(f) Programmers consider algorithm efficiency when they write code.

(i) Sorting and searching use algorithms.

Complete the table with the name of a search algorithm and a sort algorithm.

(2)

Bub sort
Merge sort
linear search
Binary search

Algorithm type	Characteristic	Algorithm name
Search	Is a divide and conquer algorithm	Binary search
Sort	Is **not** a divide and conquer algorithm	Merge sort

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Examiner Comments

This response scores 1 mark for correctly identifying binary search as a divide and conquer algorithm. Merge sort was an erroneous answer because it is also a divide and conquer algorithm.

Question 1 (f)(ii)

Most candidates scored full marks for this question for correctly identifying the relationship between the number of comparisons and execution time.

(ii) Explain **one** effect the number of comparisons has on the execution time of a sorting algorithm.

(2)

The higher the number of comparisons is, the longer the execution time of the sorting algorithm - making it less efficient.

(Total for Question 1 = 16 marks)

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This response scores 2 marks for correctly explaining the relationship between an increased number of comparisons and increased execution time.

Question 2 (a)(i)

Whilst many candidates did give the correct answer there were also a significant number who gave '8' as the response, which is the number of bits used by extended ASCII.

Question 2 (a)(ii)

Most candidates correctly calculated the ASCII value of D.

Question 2 (b)

Many candidates confused the frequency of sampling (number of samples taken per second) with the actual sampling interval which is the time between each separate sample.

(b) Sound waves are converted to binary using sample intervals.

Define the term 'sample interval'.

(1)

The amount of time between each sample that is taken

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Examiner Comments

This response scores 1 mark for defining a sample interval as the time taken between each sample.

Question 2 (c)

Many responses correctly identified *height x width* but failed to specify the units in pixels. Some candidates gave expressions for file storage size by referring to colour depth, but this was not what was required by the question. The Getting Started guide on the Pearson website gives clear amplification of the specification points and gives the size of an image as width x height in pixels.

(c) Give an expression to calculate the size of a bitmap image, not the size of the file that stores the image.

(2)

Width x Height.

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This response scores 1 mark for identifying *height x width*, but does not achieve the second mark by identifying pixels as the unit.

Question 2 (d)(i)

Whilst many candidates understood the concept of logical shifts far fewer knew how to apply an arithmetic shift correctly, often failing to keep the Most Significant Bit (MSB) consistent.

(d) Computers manipulate binary patterns.

(i) Complete the table with the result of applying the shift to the binary pattern.

(2)

Binary pattern	Shift	8-bit binary result
1010 0011	Logical shift left by 3	0001 1000
1100 1010	Arithmetic shift right by 2	1111 0010

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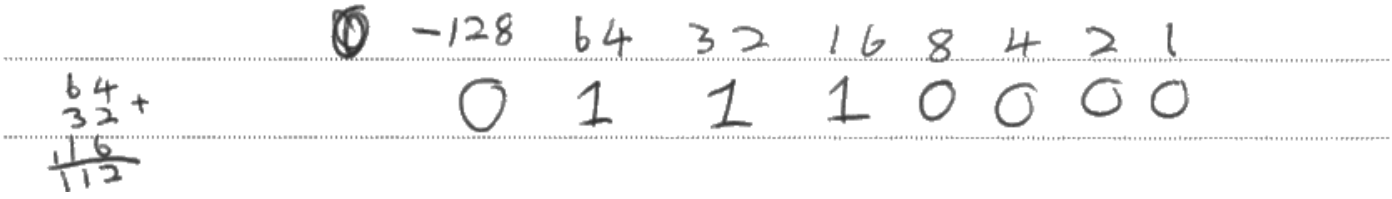
This response scores 2 marks for performing both shifts correctly.

Question 2 (d)(iii)

The vast majority of candidates could successfully convert a denary value to an 8-bit binary number.

(iii) Convert the denary value +112 to 8-bit binary representation.

(2)



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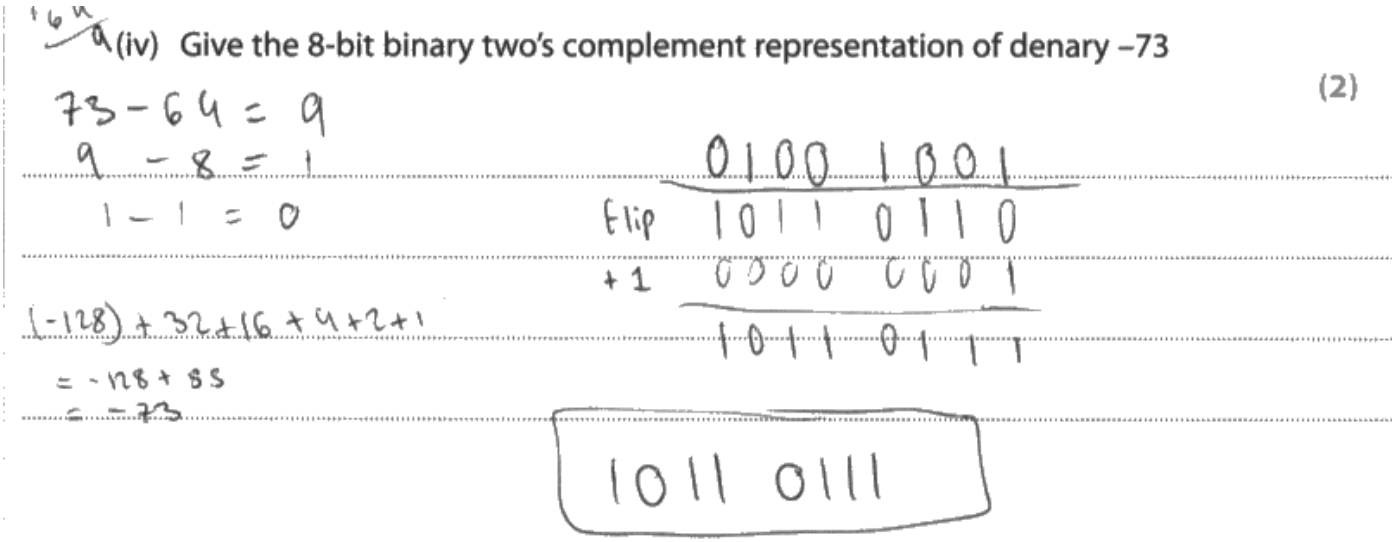
This response scores 2 marks for performing the conversion correctly.

Question 2 (d)(iv)

The vast majority of candidates demonstrated a clear understanding of how to represent a negative denary number as an 8-bit integer in two's complement. Some candidates calculated the result by writing a number line and assigning the most significant bit a negative value whilst others used the method to calculate one's complement by flipping the bits and then adding one. Where candidates used the 'flipping the bits' method a common error was to forget to add 1 to the result of this process.



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Examiner Comments

This response scores 2 marks for correctly converting the denary integer into two's complement.

Question 2 (e)(ii)

Many candidates demonstrated that they knew that 8 bits enabled 256 unique addresses to be represented. The most common incorrect response was 255 where candidates gave the largest number that can be represented with 8 bits rather than the total number of representations available.

Question 2 (f)

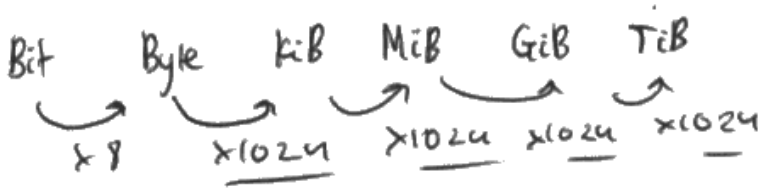
Many candidates did not manage to correctly identify how many bytes are in a tebibyte. Some candidates calculated the number of bytes in a terabyte. Other candidates did not always appreciate the relationship between KiB, MiB, GiB and TiB and gave an incorrect power such as 1024^3.

(f) Construct an expression to convert 40|681|930|227|712 bytes to tebibytes.

(2)

$$\frac{40\ 681\ 930\ 227\ 712}{1024^{4}}$$

(Total for Question 2 = 16 marks)



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Examiner Comments

This response scores 2 marks for correctly identifying that a tebibyte contains 1024^4 bytes and that the given number of bytes needs to be divided by this value.

Question 3 (a)(i)

The vast majority of candidates were able to correctly identify a Local Area Network (LAN).

Question 3 (a)(ii)

Many candidates struggled to identify that the range that a wireless network covered could be measured in meters. Some candidates confused range with bandwidth.

Question 3 (a)(iii)

The most popular answer was reliance on a common backbone where failure would mean that the whole network would stop working. Some candidates phrased this inaccurately by saying 'if the bus failed' which was not accurate enough, or erroneously thought that if one computer/workstation failed then the whole network would fail. Candidates found it harder to give a second disadvantage.

(iii) Give **two disadvantages** of a bus network topology.

(2)

1 if the backbone cable fails, all devices are disconnected

2 security risk because all devices can see the data being transmitted on the backbone cable

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Examiner Comments

This response scores 2 marks for identifying a bus is reliant on the backbone functioning and that there is a greater security risk with a shared cable.

Question 3 (b)

Many candidates had some knowledge of penetration testing but answers were frequently quite vague or limited to 'hacking' without further expansion. Common mistakes included confusion with testing in general, omitting the point that it is an attack that is authorised by the organisation, or did not expand to give the purpose being to find vulnerabilities to fix to improve security.

(b) Describe penetration testing.

(2)

Penetration testing involves purposefully attacking a network to test for vulnerabilities that could be exploited by a hacker / virus or other threat to the security of the network.

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Examiner Comments

This response scores 2 marks for correctly identifying that penetration testing is used to attack a network to find vulnerabilities.

Question 3 (c)(i)

This question was generally well answered but a number of of candidates gave an example of an application protocol rather than a protocol that is used for transmission.

(c) Network protocols control the rules of communication.

(i) Name a network protocol that transmissions from other electrical devices can interfere with and that can be blocked by walls.

(1)

Wi-Fi

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Examiner Comments

This response scores 1 mark for naming WiFi.

Question 3 (c)(ii)

Many candidates gave examples of protocols, but few could correctly identify File Transfer Protocol (FTP) as the protocol that would be used to download a file. The question was clear in terms of specifying a protocol that is used for file transfers such as downloading. Some candidates erroneously gave a music file format such as .mp3 rather than a network protocol.

Question 3 (d)

Candidates found this to be a challenging question, and the link layer appeared to be poorly understood. Some candidates appreciated that WiFi and Ethernet are protocols that are used at the link layer and some could go on to expand as to the types of signal that would be sent. Few candidates discussed MAC addresses and how they are used at the link layer. Many candidates confused the link layer with the network layer and IP addressing.

(d) Describe how the link layer of the TCP/IP protocol stack works. (2)

The link layer uses either Ethernet or Wi-Fi to ~~to~~ send data from one device to ~~to~~ another, using its IP address and data packets

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Examiner Comments

This response scores 1 mark for identifying that the Wi-Fi or Ethernet protocol can be used by the link layer.

Question 3 (e)

Many candidates gained at least 1 or 2 marks, with the most frequent mark being for identifying an expression for the total number of seconds. Some candidates confused SI units (decimal prefixes) with IEC units (binary prefixes). Candidates also struggled to remember that file storage size is in bytes and that transmission speeds are measured in bits, so a conversion factor of 8 is also required.

(e) Construct an expression to calculate the transmission rate, in megabits per second, required to transmit a 1.4 gibibyte file in 13 minutes.

You do not need to do the calculation.

(4)

$$\left(\frac{1.4 \times 1024^3 \times 8}{13 \times 60}\right) / 1000^2$$

(Total for Question 3 = 14 marks)

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This response scores full marks. It identifies 13x60 for the number of seconds, $1.4x8x1024^3$ for the total number of bits to transfer and 1000^2 for the number of bits in a megabit. Each component is then combined to construct a fully correct expression.

Question 4 (a)

Many candidates achieved some credit and the most common correct response was that the whole source code is translated in one go by a compiler and that errors are reported at the end of the process. A number of candidates gave characteristics that were given in the question such as a machine code executable file is output. A number of candidates either gave advantages of a compiler rather than characteristics or confused a compiler with an interpreter.

4 Computers

(a) A compiler translates source code to machine code. If the source code is edited, it must be recompiled.

Give **two other** characteristics of a compiler.

(2)

1 It translates the entire source code at once.

2 It creates a file of executable machine code after translation.

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Examiner Comments

This response scores 1 mark for identifying that the entire source code is translated in one go. The second point made by the candidate that an executable machine code file is output was already given in the question.

Question 4 (b)

Many candidates found this question challenging. Misconceptions included confusion with defragmentation of filing systems or the scheduling of processes, presumably because these are both topics covered under the umbrella of operating systems. Many candidates simply repeated the terms files and folders from the question. Few could clearly articulate that a hierarchical structure with a root directory is used or describe the relationship between folders and subfolders.

(b) Describe how an operating system organises files and folders.

(2)

It uses file managment, where is has a root directory and branches
It orders it in a hierachy and keeps track of were they
are bieng stored so they can be retreived.

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Examiner Comments

This response scores full marks for identifying that a hierarchical structure with a root directory is used.

Question 4 (c)

Many candidates found this to be a challenging question and there were many vague or inaccurate responses. Audit trails were frequently confused with robust programming techniques and code reviews. Where candidates did identify that an audit trail logged changes made with details of the change, they struggled to give a linked explanation to gain a second mark for saying how this information in the audit trail could be used. There was limited understanding of the accountability that is imposed by an audit trail.

(c) Explain **one** way an audit trail helps programmers create robust software.

(2)

An audit trail improves accountability and keeps track of any changes made, by who and when and it enables programmers to revert to an earlier version of code if an error occurs, allowing patches to be developed, instead of quick fixes being used, and any errors solved, so that code is free of bugs, and vulnerabilities, which could be exploited and this enables robust software to be created.

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This response scores 2 marks for identifying that an audit trail increases accountability because it logs who and when changes were made.

Question 4 (d)

Whilst many candidates gained some credit, many responses were too vague and did not clearly articulate how parts of the system such as the camera and the database would be used. Clear responses identified that the camera was required to scan the number plate and that this then had to be cross referenced to the database to determine if the car had paid or not. The question gave a lot of contextual information for the scenario which candidates were expected to draw upon to apply their knowledge.

Describe what the system does when the exit sensor is activated by a car driving towards it.

(2)

Once the car is detected the camera will scan the number plate and check the database to see whether they have paid. If they have the barrier will open and they can drive out. If not it will remain closed.

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Examiner Comments

This response scores 2 marks for stating that the camera will be used to scan the number plate and that this would then be looked up in the database.

Question 4 (e)

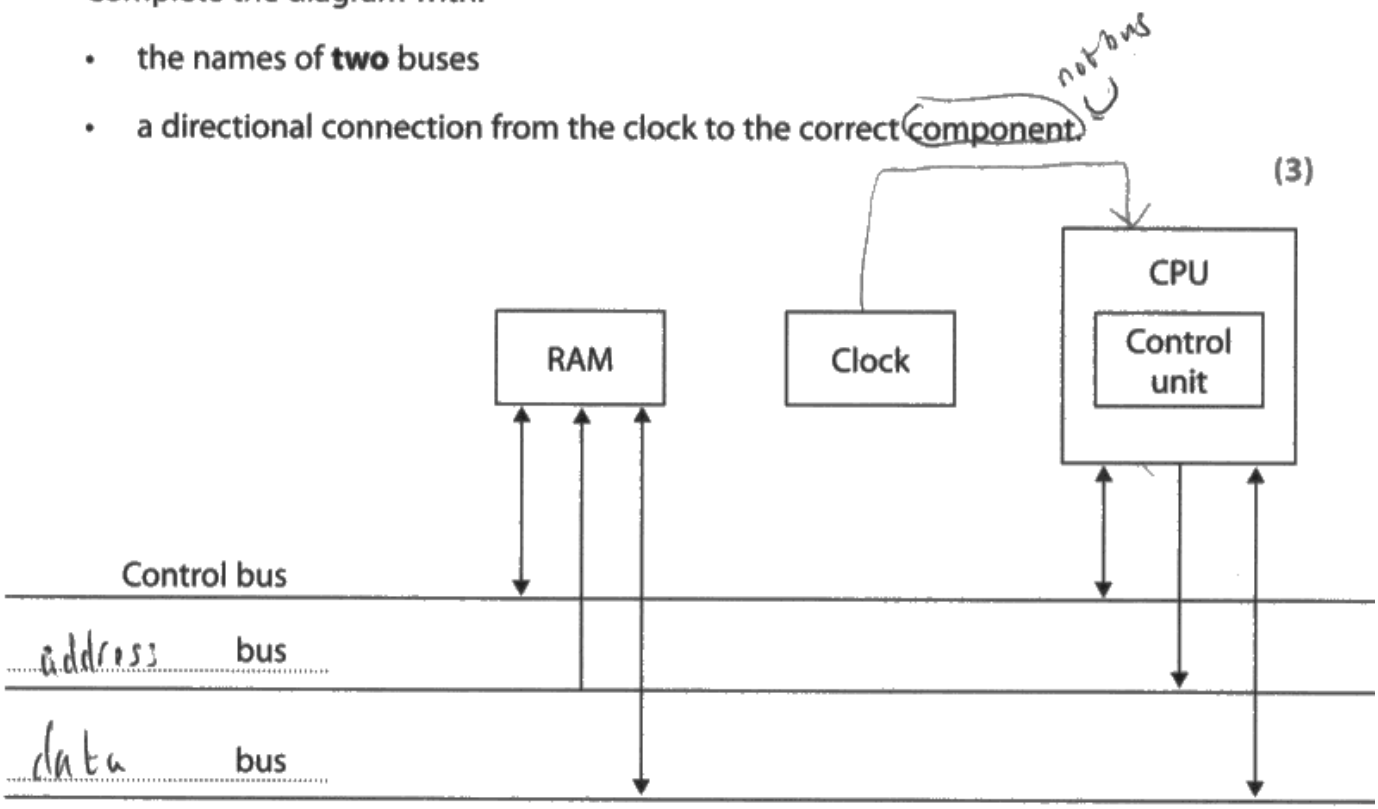
Many candidates identified the address and data bus correctly, but far fewer could connect the clock to the control unit. Many candidates erroneously connected the clock to the buses. The question also asks for one line to be drawn from the clock and many candidates did not read this and drew multiple lines.

(e) The components of a computer carry out the fetch-decode-execute cycle.

Complete the diagram with:

- the names of **two** buses
- a directional connection from the clock to the correct component.

(3)



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Examiner Comments

This response scores 3 marks for correctly completing the diagram with the address and data bus and the clock connection to the CPU.

Question 4 (f)

Many candidates demonstrated limited knowledge of low level languages and few managed to explain how assemblers could be used. Many responses displayed misconceptions or made generalisations such as high level languages are more understandable without expanding on the reasons for this being the case. Where candidates did not address the context of the question, and specifically the hardware features of the phone and the applications on the phone, they limited the marks they could achieve. It is a long question and few candidates managed to organise their response clearly through the use of structured paragraphs.

In terms of high-level programming languages, these are ideal for the smartphone's applications such as to 'edit pictures, translation, email, etc'. This is because high level programming languages are versatile and due to their similarity to human languages, can be effectively used to decompose complex tasks, abstract problems and write code for application level tasks that directly interact with the end user. The flexibility of the language allows for multiple applications to be coded efficiently and run seamlessly to deliver a rich end-user experience. As high level programming languages run on the operating system and can be easily edited and improved this improves application stability and ensures regular updates.

However, a smartphone also requires low-level language for example, assembly code, this form of language is required to interact with the hardware of the smartph directly. allowing the programmer to program the built

in-devices to perform their basic functions such as taking photographs with a camera or recording sound using the microphone. Mnemonics are used often to make programming easier as low level languages are extremely similar to machine code, it is so difficult to be written/understood by humans. Thus, low-level language provides the bridge between hardware and software and built in devices while, high level languages run on the operating system to interact directly with the user and perform tasks within applications.

(Total for Question 4 = 17 marks)

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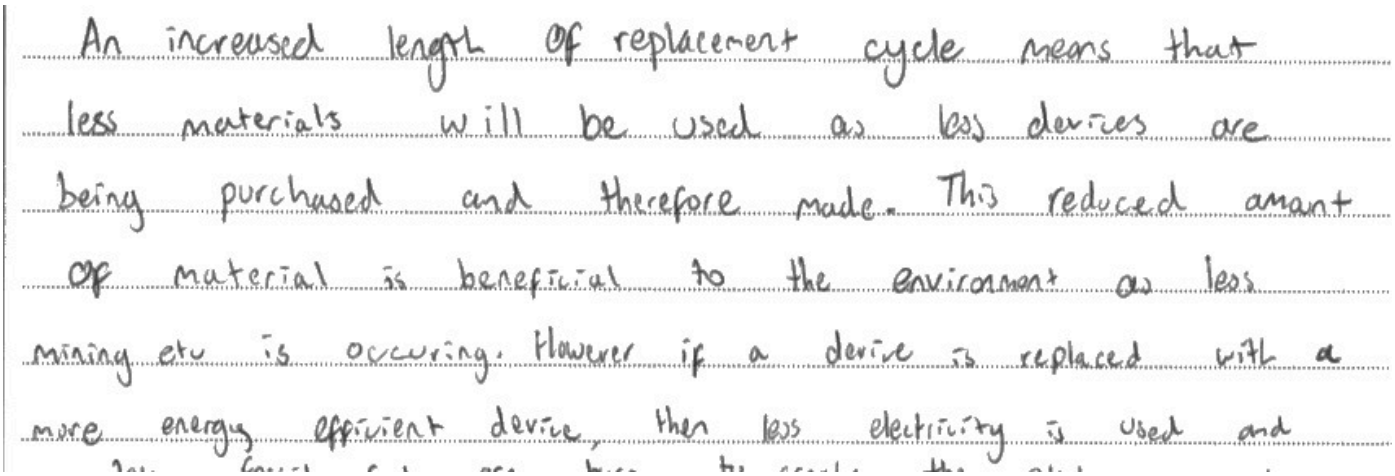
This response scores full marks for demonstrating comprehensive understanding of the key concepts that are relevant regarding the use of high and low level languages in this scenario. The response is well structured; it first examines how high level languages allow greater flexibility in terms of software development of applications. It then looks at the benefits of using assembly to access hardware specifics.

Question 5 (a)

This question was generally well answered and many candidates produced good responses to demonstrate a clear understanding of environmental issues. Whilst many candidates did score 1 mark they sometimes found it harder to give the linked expansion of the point they made for the second mark.


An increased length of replacement cycle means that less materials will be used as less devices are being purchased and therefore made. This reduced amount of material is beneficial to the environment as less mining etc is occuring. However if a device is replaced with a more energy efficient device, then less electricity is used and

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This response scores 2 marks for clearly identifying that increased cycle length means less production and that this means less material needs to be mined.

Question 5 (b)

Many candidates correctly identified that an advertising slogan can be protected by either a trademark or copyright. Fewer candidates were able to identify that hardware inventions can be patented.

Question 5 (c)

Many candidates were familiar with the concept of automated systems in the context of a car and could give good examples of how sensor readings would be used as the basis for a dependent action. Weaker responses tended to be generic, such as self-driving cars, without identifying the actual systems within the car that enabled this to be the case.

(c) Robots use sensors to collect data about their surroundings in order to carry out actions independently.

Explain **one** way that a modern car is a robot.

(2)

A modern car uses sensors for its windscreen wipers. Sensors in the car detect the levels of water on the windscreen. If there is too much water, the car activates the wipers automatically.

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This response scores 2 marks for identifying that windscreen wipers can be activated automatically when a rain sensor detects rain.

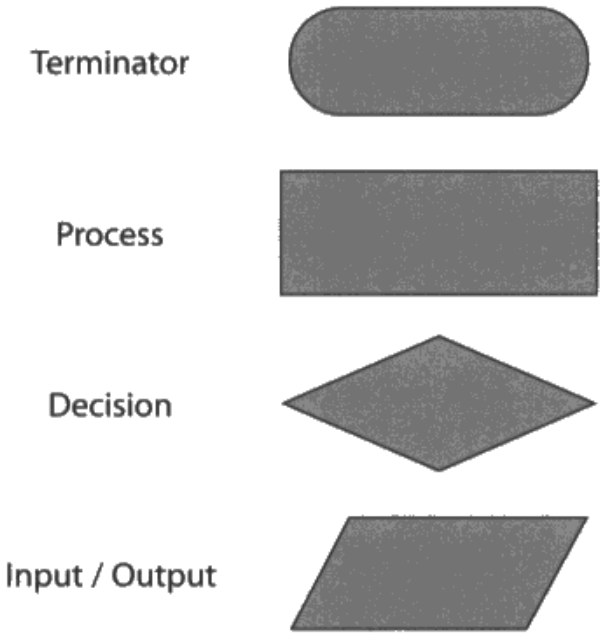
Question 5 (d)

Many candidates made a reasonable attempt to produce a recognisable flowchart. Some common errors included not showing directional arrows on flow lines, having decision boxes that did not have exactly two clearly labelled outputs and leaving hanging symbols.
Relatively few candidates knew the more theoretical knowledge required to state that a virus checker uses a signature library/database and that the target file is scanned/compared to this database to see if there is potential malware, so were limited to 4 marks at most. Most candidates started their responses with a decision being made as to whether the file had a virus or not without covering the preceding steps.

(d) Anti-malware protects systems from viruses.

Draw a flowchart in the box provided to show how anti-malware detects a virus in a file and what it does with the file.

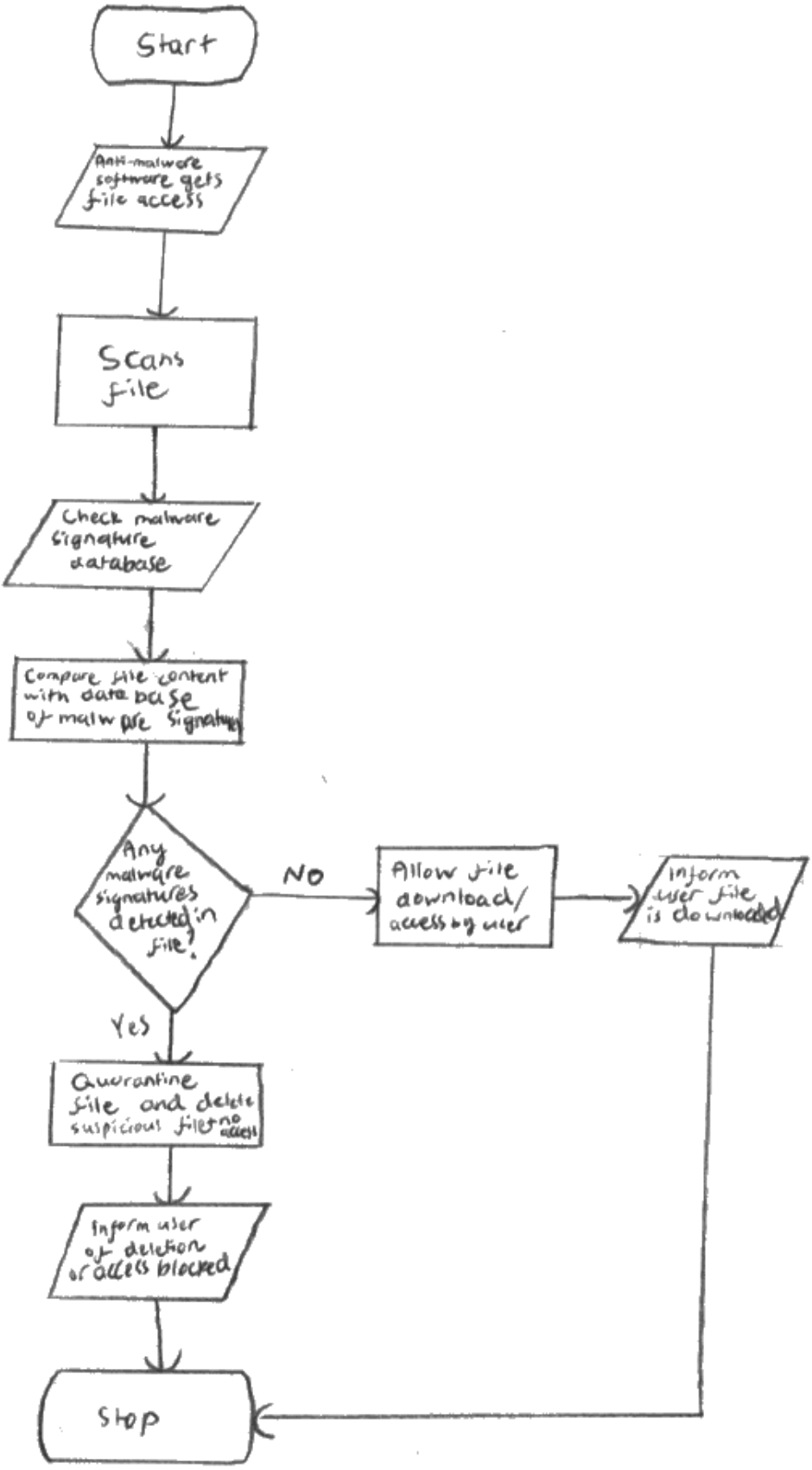
Here are some flowchart symbols:



You may not need to use all the flowchart symbols.

(6)

gets file access
scans file
if malware signature detected in file from database — File safe
Quarantine file
ask user to delete or
File allowed to download
del
delete file
are there any more suspicious files


Start
Anti-malware software gets file access
Scans file
Check malware signature database
Compare file content with data base of malware signatures
Any malware signatures detected in file?
NO
Allow file download/ access by user
inform user file is downloaded
Yes
Quarantine file and delete suspicious file/ no access
Inform user of deletion or access blocked
Stop

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This response scores 6 marks for a very clear and well-constructed solution that covers each of the mark points.

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.
- Familiarise yourself with the appropriate symbols and conditions to ensure clarity and accuracy in diagrammatic representations of algorithms when using flowcharts.

Grade boundaries

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