

AS LEVEL

Examiners' report

COMPUTER SCIENCE

H046

For first teaching in 2015

H046/01 Summer 2022 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 answers 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 OCR.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our [website](#).

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Paper 1 series overview

H046/01 (Computing Principles) is one of two examined components for the GCE AS Level Computer Science. This component focuses on:

- the characteristics of contemporary processors, input, output and storage devices
- software and software development
- programming
- exchanging data
- data types, data structures and algorithms
- legal, moral, ethical and cultural issues.

To do well on this paper, candidates need to be able to demonstrate and apply knowledge across all the topics listed above in different contexts.

Advance information was provided for some but not all questions. Candidates were advised that some questions would be on content not listed.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
<ul style="list-style-type: none"> • understood the terminology for memory management in Question 1 • were able to produce truth tables and simplify expressions for Question 5 (a) • successfully wrote programming code in Question 6 (c). 	<ul style="list-style-type: none"> • did not use key terminology in Question 1 (b) and Question 1 (d) • demonstrated limited discussion in Questions 2 (c) and 3 (c) • showed limited understanding of the TCP/IP stack for Question 3.

Question 1 (a)

1 Arnold has several computing devices around his home. Each device has an operating system installed.

(a) Arnold has a PC which has a Basic Input Output System (BIOS).

Describe what is meant by the term 'BIOS'.

.....

.....

.....

..... [2]

This was generally answered well, although some candidates were vague in their response. The concept of the BIOS booting up the Operating System was missed by some, but most candidates mentioned the BIOS checking that the hardware is operational (POST).

Exemplar 1

Basic input output system, responsible
 for the power on self test (POST) which
 checks memory and processing units are working correctly.
 use used to call the bootstrap, which will load
 operating system. [2]

Exemplar 1 was given full marks. The candidate achieved the first mark for being clear that the BIOS checks hardware and has provided a suitable example. The second mark has been awarded for explaining that the BIOS loads the operating system. Although it was not essential to mention POST (Power-On-Self-Test) this is useful to explain the process that occurs.

Question 1 (b) (i)

- (b) Arnold has a router. It will receive data packets from other computers on Arnold's network or the internet and then route them on to the next step.

The scheduling algorithm Arnold's router uses is First Come First Served.

- (i) State the name of **one** other scheduling algorithm.

.....

..... [1]

Round Robin was the most popular answer by far. Most candidates achieved the mark although some used the example in the question. Candidates should be reminded to read the questions carefully here and to not repeat answers already provided.

Question 1 (b) (ii)

- (ii) Explain why First Come First Served is a suitable scheduling algorithm for Arnold's router.

.....

.....

.....

..... [2]

Few candidates achieved both available marks and most missed the concept of jobs/packets having equal priority.

Question 1 (c)

(c) One role of an operating system is to manage the computer's memory.

Two types of memory management are paging and segmentation.

Describe **one** difference between paging and segmentation.

.....

.....

.....

..... [2]

To get both marks, candidates need to be clear that paging and segmentation are about allocating memory. Many candidates were not clear on this and discussed managing data or packets. Candidates should be careful to use the correct terminology for questions of this type in particular.

Question 1 (d) (i)

(d) Different computing devices in Arnold's home use different processor architectures.

One processor architecture is the Harvard architecture.

(i) Describe the Harvard architecture.

.....

.....

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..... [2]

Some candidates were vague in their response and were not clear that Harvard has separate memory blocks. Candidates must be specific in their response.

Question 1 (d) (ii)

- (ii) Arnold has a smart washing machine.

Explain why the Harvard architecture is suitable for a device like this.

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..... [2]

This question was not answered well. Many candidates repeated their response to the previous question and did not answer the question correctly. Candidates need to read questions carefully.

Question 1 (e) (i)

- (e) Another role of an operating system is the Interrupt Service Handler. This allows processes being executed by the CPU to be interrupted.

- (i) One example of an interrupt would be removing an external hard disk drive from a computer.

State why this would need to interrupt the current fetch-decode-execute cycle of the CPU.

.....

..... [1]

Very few candidates achieved a mark here. Many mentioned that the CPU would be busy but were not specific enough to gain the mark. In questions of this type, examples need to be specific to the question.

Question 1 (e) (ii)

- (ii) Interrupt Service Handlers make use of a stack data structure.

Describe how a stack is used when handling interrupts.

.....

.....

.....

..... [2]

Few candidates gained both marks for this question. The concepts of pushing and popping items was mentioned by many candidates although this was often too vague and didn't link to the question. Candidates needed to use the correct terms for accessing items from a stack to gain the marks in this question.

Question 2 (a)

- 2 Charlie owns a veterinary surgery in her local town. She has purchased a new computer for her business so she can complete her accounts, write letters to her customers and keep a record of her customers' personal and appointment details.

She intends to install application software and utility software.

- (a) Charlie will install database application software on her computer.

State **one** additional type of application software Charlie could install and give an example of what she might use it for.

.....

.....

.....

..... [2]

This question was generally answered well. Several candidates wrote brand names which was not an acceptable answer. Some candidates gave an example of a utility which was required for Question 2 (b). To gain both marks, candidates were required to choose a suitable application type which would be useful in the given scenario.

Candidates are reminded not to use brand names for questions of this type.

Question 2 (b)

(b) Charlie's computer has firewall utility software already installed.

Explain **two** other pieces of utility software that Charlie should install on her computer.

1

.....

.....

.....

.....

2

.....

.....

.....

[4]

This question was generally answered well although many candidates achieved 2 rather than 4 marks. Commonly, two utilities were correctly identified but the explanation to accompany the utility was too vague. Candidates were required to give examples of how the utilities could be used with the given scenario.

Question 2 (c)*

(c)* Charlie will use database management software to store customers' personal and appointment details. Charlie is considering both open source and closed source database software.

Compare the differences between open source software and closed source software and recommend which type of database software Charlie should use.

You should refer to the following in your answer:

- Cost
- Usability
- Extensibility
- Security
- Support available

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.....

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.....

[9]

Candidates were assessed on the quality of their extended response in this question. Most of the candidates were clear on the basic difference between open and closed source software but did not link this in with the scenario. Mid-level responses were common with few candidates having a balanced discussion with coverage of all four of the required sections.

Question 3 (a)

3 Modern computer systems use networking in order to share hardware, software and data.

Networking uses protocols such as TCP/IP.

(a) State what is meant by the term 'protocol'.

.....

.....

[1]

This question was answered well.

Question 3 (b) (i)

(b) The protocol TCP/IP uses a 4-layer stack.

(i) Complete the table below to show the 4 layers in the TCP/IP stack.

Application
Link

[2]

Most candidates achieved both marks for this question. The order of the layers was not important to get both marks and many candidates gave “Transport” and “Network” as the two missing layers. Some candidates gave “Internet” in place of “Network” which was also acceptable.

Question 3 (b) (ii)

(ii) Explain **one** advantage of using layers in the protocol TCP/IP.

.....

.....

.....

..... [2]

This question was generally not answered well. Candidates that did gain marks, focused on the concept of layers being independent. Many candidates missed this concept and did not achieve the marks. Candidates should be careful to use the correct terminology for questions of this type.

Question 3 (c)*

(c)* Many technologists predict that in the future, shops on the high street will use facial recognition to identify customers before they walk into a shop.

Discuss the possible benefits and drawbacks of technology being used in this way.

You should refer to the following in your answer:

- The benefits and drawbacks to both the customers and businesses
- Moral and ethical issues
- Legal issues

.....

.....

.....

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.....

..... [9]

Candidates were assessed on the quality of their extended response in this question.

Most candidates understood the basic concept of storing personal details being a violation of customers civil liberties. Few candidates had a balanced discussion and focused too heavily on the negative aspects of this system therefore being restricted to a mid-level mark.

Question 4 (a)

4 (a) State why computer systems store data in binary.

.....

..... [1]

This question was generally answered well.

Question 4 (b) (i)

(b) (i) Convert the denary number 97 into an 8-bit binary number.

.....

.....

.....

..... [1]

To gain the mark, the candidate was required to use all 8 bits. Some used 7 bits and therefore did not achieve the mark. Candidates should be reminded to read through each question carefully.

Question 4 (b) (ii)

(ii) Convert the denary number 171 into a hexadecimal number.

.....

.....

.....

..... [1]

This question was answered well with most errors relating to a miscalculation.

Question 4 (b) (iii)

(iii) Convert the denary number -97 into an 8-bit binary number using two's complement.

.....

.....

.....

..... [1]

This was generally answered well although some candidates were confused between two's complement and sign and magnitude.

Question 4 (b) (iv)

(iv) Convert the denary number -17 into an 8-bit binary number using sign and magnitude.

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

As with Question 4 (b) (iii), this was answered well although some candidates gave an answer using two's complement.

Question 4 (c)

(c) State **one** advantage of using two's complement instead of sign and magnitude.

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

This question was worth either 2 or 0 marks. It was generally not answered well with most candidates being too vague.

Question 4 (d)

(d) Calculate the addition of these two 8-bit (unsigned) binary numbers.

Show your working.

$$\begin{array}{r} 11011011 \\ \underline{10001001} \end{array} +$$

[2]

As with the other binary calculation, this was generally answered correctly. Some candidates gave the wrong answer but gained a mark for evidence of a suitable method. The question reminds candidates to show their working and most candidates did.

Question 5 (a)

5 Elliott has designed a logic circuit. The expression he has created for the logic circuit is:

$$Q = (A \wedge \neg B) \vee (\neg A \wedge C \wedge D) \vee (A \wedge B)$$

(a) Complete the Karnaugh Map below to simplify this expression. Show your working.

		AB			
		00	01	11	10
CD	00				
	01				
	11				
	10				

Simplified expression:

.....
 [4]

This question was answered well with many candidates achieving all 4 marks. Some completed the table correctly but were not able to simplify the expression appropriately.

Question 5 (b)

(b) Draw a Logic diagram for the following expression:

$$Q = \neg(A \wedge B) \vee (C \wedge \neg D)$$

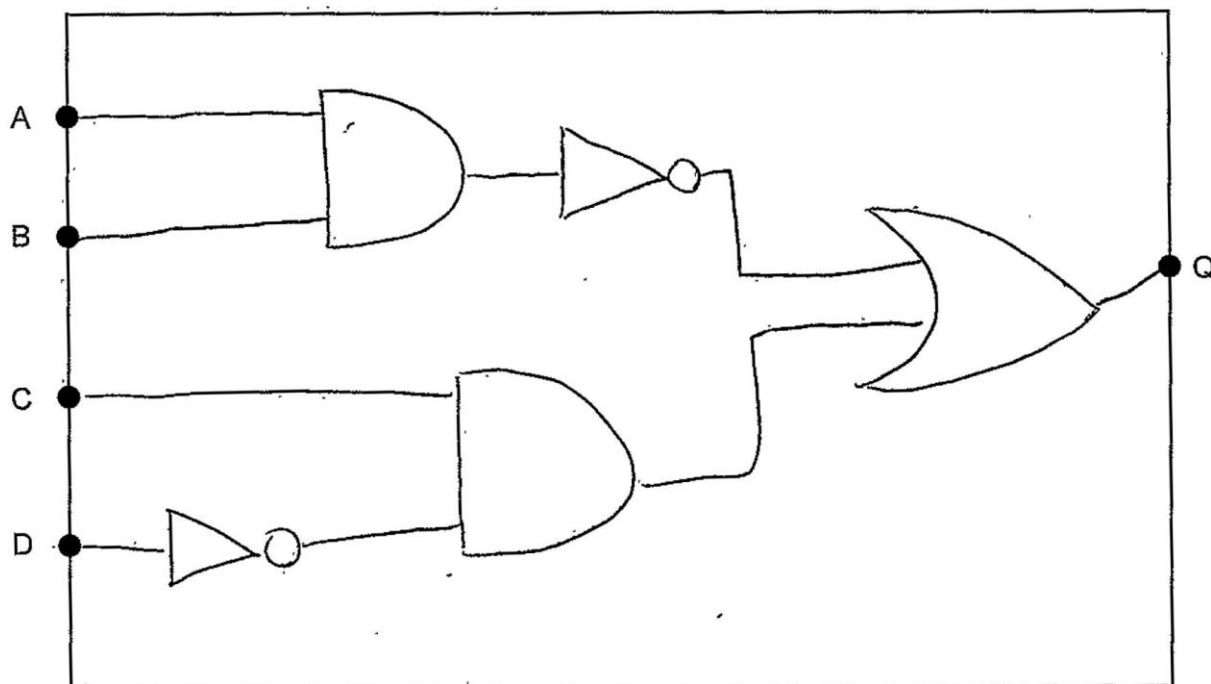


[3]

As with the first part of this question, this was answered well. Most candidates used the same gates that are shown in the mark scheme, although equivalent gates were accepted. Some candidates lost marks for not being clear on the type of gate they had decided on.

Exemplar 2

$$Q = \neg(A \wedge B) \vee (C \wedge \neg D)$$



Exemplar 2 was given full marks. This candidate has gained all 3 marks as the gates are correct and are clearly drawn to avoid confusion. Each gate also has the correct number of inputs and outputs in all three instances.

Logic gate guidance

To make sure full credit is given for the answers provided, it is essential that the drawings are clear enough to distinguish one gate from another. Some gates look similar, so the lines and symbols need to be clear enough to establish which gate has been used.

Question 6 (a)

6 George owns a small book shop. He wants a program to work out the daily sales figures.

He uses a text file called "Sales.txt" shown in **Fig. 1**. Each line represents the sales total for a different day of the week. The program can run at any point during the week and therefore the text file may not have seven lines.

2367.34
1986.92
2251.49
1882.40
2412.83
3411.32
2721.76

Fig. 1

The program needs to read the text file and then calculate:

- The number of days that the program is calculating over
- The total sales over that period
- The average daily sales over that period

At the end of the text file, it should then print the results of these calculations to the screen.

(a) When the values are being read from the Sales.txt file they will be a string data type.

In order for them to be processed they will need to be cast (i.e. converted) to a different data type.

Explain what data type the values in "Sales.txt" should be converted to.

.....

.....

.....

..... [2]

This was generally answered well although some candidates picked Integer for the data type which would not be accurate given that averages are likely to be a decimal value. There are a range of data types that support decimal values, any of which would be acceptable as an answer.

Question 6 (b)

(b) George will use iteration to read through the values in the text file.

Describe how George can use iteration when reading from the text file.

.....

.....

.....

..... [2]

This was also answered well although some candidates used the word 'iteration' in their answer without going to describe what this means. As this was in the question, further detail was required such as repeating or looping through the text file.

Question 6 (c)

(c) Write a procedure called `salesAnalysis` that will meet the rules of George's program.

You should write your procedure using pseudocode or program code.

.....

.....

.....

.....

.....

.....

..... [7]

Most candidates achieved a few marks, but few achieved the maximum marks available. The question states that pseudocode or program code could be used so a variety of answers were given.

The OCR pseudocode guide gives guidance on how to write pseudocode including data structures, constructs, and reading/writing to file. Some candidates wrote neither pseudocode or program code and therefore were given no marks.

Many candidates remembered to open the sales file, but many forgot to close the file. Initialising the variables before the loop was also missed by a number of candidates.

Increasing the total was included in many responses, although many forgot to cast the total to a numeric data type to enable this to work correctly.

Many candidates achieved the last 2 marks for calculating the average and then displaying the calculated values. Some missed the final output as the text was incorrectly concatenated with the variable values.

Exemplar 3

```

SalesFile = openRead("Sales.txt")
numofdays
number of days = 0
total = 0
While NOT EOF:
    line = SalesFile.readline()
    Sale = Float(line)
    numofdays = numofdays + 1
    total = total + Sale
endwhile
SalesFile.close()
print("The number of days calculate over is" + str(numofdays)
      + str(numofdays))
print("The total sales are" + str(total))
Average = total / numofdays
print("The average sales are" + str(Average))

```

out of bound
→

Exemplar 3 was given full marks. The candidate has gained the first mark for initialising the variables "numofdays" and "total". The second mark has been awarded for the first line, which opens the sales file and closing the file after the loop has finished. The while loop gains the third mark which repeats until the end of the file is reached. The fourth mark is awarded for reading each line of the file correctly. The fifth mark correctly increases total in each iteration. Sale has been correctly converted to a "float" data type beforehand to make this possible. The sixth mark is awarded for calculating the average on the penultimate line. The final mark is awarded for printing the number of days, total sales and the daily average. This has been concatenated correctly with a plus symbol. Some candidates used the comma which was also acceptable.

The syntax provided in this example relates to Python whereas some candidates wrote pseudocode or another high-level language. Some candidates lost marks for writing the steps in everyday English which is not what the question stipulated.

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