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GCSE (9–1) Computer Science
J276/02 Computational thinking, algorithms and programming
Sample Question Paper

Date – Morning/Afternoon

Time allowed: 1 hour 30 minutes

You may not use:

- a calculator



* 0 0 0 0 0 0 *

First name

Last name

Centre number

Candidate number

INSTRUCTIONS

- Use black ink.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION

- The total mark for this paper is **80**.
- The marks for each question are shown in brackets [].
- This document consists of **16** pages.

1 Kofi uses his computer to record an audio file of himself playing his guitar.

(a) Outline what happens when the computer converts the music into a file.

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.....
.....

[2]

(b) Kofi increases the sample rate his computer is using to record his guitar.

Explain **two** effects this will have on Kofi's recording.

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[4]

(c) Kofi is e-mailing his recording to a record label. He uses lossy compression to produce the music file.

Explain **two** reasons why using lossy compression is beneficial.

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[4]

2 (a) Order the following units from smallest to largest:

GB bit PB byte nibble MB

.....

[1]

(b) Convert the decimal number 191 into an 8 bit binary number.

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[1]

(c) Convert the hexadecimal number 3E into a decimal number. You must show your working.

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[2]

Specimen

- (e) (i) Add together the following two 8 bit binary numbers. Express your response in an 8 bit binary form.

01101010

10010110

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.....

[2]

- (ii) Identify the problem this addition has created.

.....

.....

[1]

- 3 (a) Complete a 2 place right shift on the binary number 11001011.

.....

.....

[1]

- (b) Explain the effect of performing a 2 place right shift on the binary number 11001011.

.....

.....

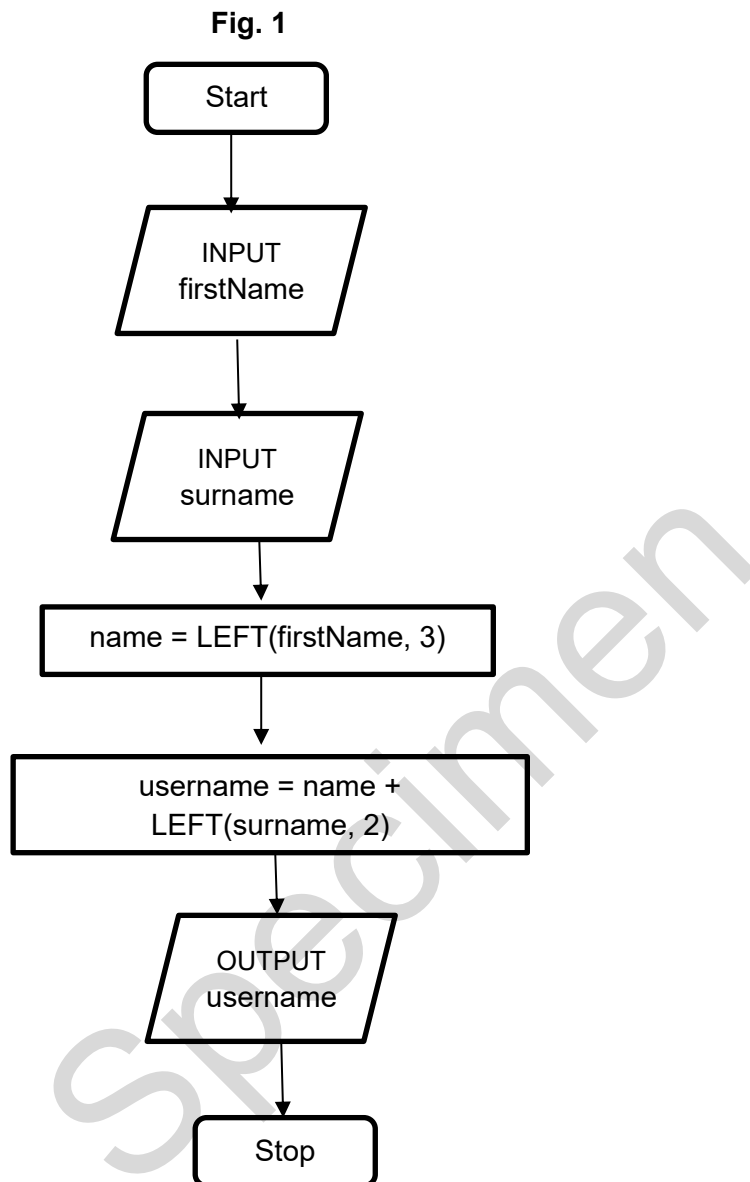
[2]

- (c) Complete the truth table below for the Boolean statement $P = \text{NOT } (A \text{ AND } B)$.

| A | B | P |
|-------|-------|-------|
| FALSE | FALSE | TRUE |
| FALSE | TRUE | |
| TRUE | FALSE | |
| TRUE | TRUE | FALSE |

[2]

- 4 Johnny is writing a program to create usernames. The first process he has developed is shown in the flowchart in **Fig. 1**.



For example, using the process in **Fig. 1**, Tom Ward's user name would be TomWa.

(a) State, using the process in **Fig. 1**, the username for Rebecca Ellis.

.....

[1]

5 Harry is planning to create a computer game using a high-level programming language.

(a) State why the computer needs to translate the code before it is executed.

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[1]

(b) Harry can use either a compiler or an interpreter to translate the code.

Describe **two** differences between how a compiler and an interpreter would translate Harry's computer game.

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[4]

6 Heath is researching how long, to the nearest minute, each student in his class spends playing computer games in one week (Monday to Friday). He is storing the data in a 2D array.

Fig. 2 shows part of the array, with 4 students.

Fig. 2

Students

| Days of the week | Students | | | |
|------------------|----------|----|----|----|
| | 0 | 1 | 2 | 3 |
| 0 | 60 | 30 | 45 | 0 |
| 1 | 180 | 60 | 0 | 60 |
| 2 | 200 | 30 | 0 | 20 |
| 3 | 60 | 10 | 15 | 15 |
| 4 | 100 | 35 | 30 | 45 |

For example, student 1, on Monday (day 0), played 30 minutes of computer games.

(a) Explain why Heath is using an array to store the data.

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[2]

- (b) (i)** Identify a data type that could be used to store the number of minutes in this array.

.....
[1]

- (ii)** State why this data type is the most appropriate.

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[1]

- (c)** Heath wants to output the number of minutes student 3 played computer games on Wednesday (day 2). He writes the code:

```
print (hoursPlayed[3,2])
```

The output is 20.

- (i)** Write the code to output the number of minutes student 0 played computer games on Wednesday.

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

- (ii)** State the output if Heath runs the code:

```
print (hoursPlayed[2,1])
```

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[1]

- (iii)** State the output if Heath runs the code:

```
print (hoursPlayed[3,1] + hoursPlayed[3,2])
```

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[1]

- (iv)** Write an algorithm to output the total number of minutes student 0 played computer games from Monday (day 0) to Friday (day 4).

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[3]

- 7 Willow has created a hangman program that uses a file to store the words the program can select from. A sample of this data is shown in **Fig. 3**.

Fig. 3

| | | | | | |
|-------|------|--------|---------|-------|-------|
| crime | bait | fright | victory | nymph | loose |
|-------|------|--------|---------|-------|-------|

- (a) Show the stages of a bubble sort when applied to data shown in **Fig. 3**.

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[4]

- (b) A second sample of data is shown in **Fig. 4**.

Fig. 4

| | | | | | | | | |
|-------|-------|------|-------|--------|-------|------|------|-------|
| amber | house | kick | moose | orange | range | tent | wind | zebra |
|-------|-------|------|-------|--------|-------|------|------|-------|

Show the stages of a binary search to find the word 'zebra' when applied to the data shown in **Fig. 4**.

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[4]

(b) Identify **two** variables used in the program.

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[2]

(c) (i) Identify **one** item in the program that could have been written as a constant.

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[1]

(ii) Give **one** reason why you have identified this item as a constant.

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[1]

(d) Finn uses an IDE (Integrated Development Environment) to write his programs. Identify **two** features of an IDE that Finn might use.

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[2]

Specimen

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