Centre Number						Candidate Number				
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Other Names										
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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
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11	
12	
TOTAL	

AQA

General Certificate of Secondary Education
June 2014

Computer Science 4512/2

Unit 2 Computing Fundamentals

Thursday 12 June 2014 1.30 pm to 3.00 pm

You will need no other materials
You must **not** use a calculator.

Time allowed
- 1 hour 30 minutes

Instructions
- Use black ink or black ball-point pen. Use pencil only for drawing.
- Answer **all** questions.
- Questions 10 and 11 should be answered in continuous prose. In these questions you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 84.
- You are reminded of the need for good English and clear presentation in your answers.

A

Answer **all** questions in the spaces provided.

1 (a) State the denary representation of the binary number 10010111

[1 mark]

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1 (b) State the hexadecimal representation of the denary number 125. You must show your working.

[2 marks]

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1 (c) Give **one** reason why programmers often use hexadecimal, instead of binary, to represent numbers.

[1 mark]

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1 (d) The ASCII character set uses seven bits to encode every character.

What is the total number of characters that can be encoded in ASCII?

[1 mark]

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1 (e) **Table 1** shows four stages in converting sound into a digital form.

Show the correct order for the stages by labelling them with the numbers 1 – 4 (1 being the first stage).

[3 marks]

Table 1

Stage	**Order (1 – 4)**
binary representation of level stored	
microphone picks up sound waves	
value read at specific point and rounded to a level	
converted to an electrical analogue signal	

1 (f) Describe how a black and white image could be represented as a bitmap in binary.

[3 marks]

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11

Turn over for the next question

2 A typical computer's main memory consists of both volatile memory and non-volatile memory.

2 (a) (i) Explain what is meant by the term **volatile memory**.

[1 mark]

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2 (a) (ii) What is normally stored in the non-volatile part of a computer's main memory?

[1 mark]

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2 (b) Explain why having cache memory can improve the performance of the Central Processing Unit (CPU).

[2 marks]

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2 (c) State **two** characteristics, other than the size of cache memory, that can improve the performance of CPUs.

[2 marks]

Characteristic 1.....

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Characteristic 2.....

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6

3 **Figure 1** shows a pseudocode representation of the function called `FindHighest`. `FindHighest` is used to find the largest value stored in an array.

Note: line numbers have been shown but are not part of the function.

Figure 1

```
1          FUNCTION FindHighest(arr)
2            highest ← arr[1]
3            FOR i ← 2 TO LEN(arr)
4              IF arr[i] > highest THEN
5                highest ← arr[i]
6              ENDIF
7            ENDFOR
8            RETURN highest
9          ENDFUNCTION
```

3 (a) How many parameters does the function `FindHighest` have?

[1 mark]

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3 (b) This function uses iteration. Give the line number on which iteration **starts**.

[1 mark]

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3 (c) This function uses selection. Give the line number on which selection **starts**.

[1 mark]

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3 (d) This function uses variable assignment. Give the line number in the function where variable assignment is **first** used.

[1 mark]

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3 (e) The variable `i` in **Figure 1** only has scope between lines `3` and `7`. Explain with reference to the variable `i` what scope means.

[1 mark]

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5

4 (a) What is a computer network?

[2 marks]

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4 (b) Three actions that can take place in a computer network are shown in **Table 2**. Tick **one** box in each row of the table to show if the action would normally occur at the client end, the server end, or at both.

[3 marks]

Table 2

Event	Client	Server	Both
Displaying an HTML page			
Receiving messages			
Starting the handshaking process			

5

5 **Figure 2** shows an example of a tablet computer.

Figure 2

5 (a) One characteristic of a tablet computer is that it has a number of built-in physical devices to input data, such as a touchscreen.

State **three other** built-in physical devices that allow data to be input to a typical tablet computer.

[3 marks]

1 .....

2 .....

3 .....

Question 5 continues on the next page

5 (b) Tablet computers normally use solid state storage media instead of magnetic storage media.

State and explain **two** differences, other than cost and storage capacity, that make solid state media a better choice than magnetic media for tablet computers.

[4 marks]

Difference 1 .....

Explanation 1 .....

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Difference 2 .....

Explanation 2 .....

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7

6 Explain how data is read from optical media such as a CD.

[5 marks]

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Turn over for the next question

7 **Figure 3** shows a function:

Figure 3

```
FUNCTION Compare(x,y)
  IF x > y THEN
    RETURN 1
  ELSE
    IF x < y THEN
      RETURN -1
    ELSE
      RETURN 0
    ENDIF
  ENDIF
ENDFUNCTION
```

7 (a) The function `Compare` returns an integer value.

Explain why a Boolean return value could not have been used.

[1 mark]

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7 (b) Each of the following expressions evaluates to an integer. Give the integer value for each:

7 (b) (i) `Compare(4,4)`

[1 mark]

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7 (b) (ii) `Compare(1,-1)`

[1 mark]

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7 (b) (iii) `Compare(Compare(4,4),Compare(1,-1))`

[1 mark]

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4

8 (a) Six database terms are given below. For each row in **Table 3**, choose the letter from **A**, **B**, **C**, **D**, **E** or **F** which best matches the description.

[4 marks]

Letters should not be used more than once.

A. Field
B. Foreign key
C. Index
D. Primary key
E. Record
F. Relationship

Table 3

Definition	Letter
a row of data within a table	
uniquely identifies a row of data	
links between tables	
used to speed up searches	

Question 8 continues on the next page

8 (b) The two tables **Class** and **Teacher** form a relational database.

Class

ClassID	Size	DayTaught	TeacherID
Red7	24	Monday	tur
Blue7	29	Tuesday	mil
Yellow7	29	Wednesday	mcc
Red8	31	Wednesday	mcc
Red9	26	Thursday	mcc
Blue9	24	Thursday	mil
CompA10	17	Thursday	mil
CompB10	19	Friday	tur

Teacher

TeacherID	Surname	Room
tur	Turing	405
mil	Milner	406
mcc	McCarthy	412a

8 (b) (i) The following incomplete SQL query should find the ClassID of every class taught on a Monday or a Wednesday. The WHERE clause is missing.

```
SELECT ClassID
FROM Class
```

In **Table 4** place a tick next to the correct WHERE clause to complete the query.

[1 mark]

Table 4

WHERE clause	Tick
`WHERE DayTaught  = Monday OR  DayTaught = Wednesday`	
`WHERE DayTaught = 'Monday' OR 'Wednesday'`	
`WHERE DayTaught = 'Monday' OR DayTaught = 'Wednesday'`	
`WHERE DayTaught = 'Monday' AND DayTaught = 'Wednesday'`	

8 (b) (ii) List the results of executing the following SQL query on the database shown in **8(b)**.

[4 marks]

```
SELECT Class.ClassID, Class.DayTaught
FROM Class, Teacher
WHERE Teacher.Room = '405' AND Class.TeacherID =
Teacher.TeacherID
ORDER BY Class.ClassID ASC
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Turn over for the next question

9 This code is supposed to find out if a positive integer entered by a user is exactly divisible by the number 3.

Note: line numbers have been included and are not part of the code.
Note: lines starting with a **#** indicate a comment.

```
1          # user input
2          n ← USERINPUT
3          # check if divisible by 3
4          WHILE n ≥ 0
5            n ← n − 3
6          ENDWHILE
7          IF n = 0 THEN
8            OUTPUT 'is divisible by 3'
9          ELSE
10           OUTPUT 'is not divisible by 3'
11         ENDIF
```

9 (a) The programmer realises there is an error because a user input of 6 incorrectly outputs `'is not divisible by 3'`.

9 (a) (i) In **Table 5** place a tick next to the type of error that the programmer has found.

[1 mark]

Table 5

Type of error	Tick
Logical	
Runtime	
Syntax	

9 (a) (ii) State the line number of the code containing the mistake that causes this error to occur.

[1 mark]

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9 (a) (iii) What change needs to be made to the line of code you have identified in your answer to **9(a)(ii)** so that the program will work correctly?

[1 mark]

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9 (b) What type of error could occur if the user enters the value `eight`?

[1 mark]

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9 (c) There are many tools that can help the programmer to reduce errors in their code when developing a computer program. State **three** tools that can help to identify errors or reduce the chance of there being errors when developing a program.

[3 marks]

Tool 1.....

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Tool 2.....

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Tool 3.....

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7

Turn over for the next question

10 A programmer is developing a piece of software.

The programmer uses **unit testing** as part of the development process. Compare unit testing with another type of testing that **the programmer** could use. In your answer you should also include a description of what unit testing is.

In this question you will be marked on your ability to use good English, to organise information clearly and to use specialist vocabulary where appropriate.

[6 marks]

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11 Discuss **three** advantages and/or disadvantages of using external code sources in a program.

In this question you will be marked on your ability to use good English, to organise information clearly and to use specialist vocabulary where appropriate.

[6 marks]

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Turn over for the next question

12 The following algorithm determines the number of carriages a train will need.

The array called `passengers` is used to store the change in the number of passengers at each train station. For example, at the first stop the total number of passengers increases by 100, at the second stop the total number of passengers decreases by 20, at the third stop the total number of passengers increases by 70 and so on.

Note: array indexing starts at 1.

```
passengers ← [100, -20, 70, -50, -100]
carriages ← 0
total ← 0
max ← 0
index ← 1
WHILE index ≤ 5
  total ← total + passengers[index]
  IF total > max THEN
    max ← total
  ENDIF
  index ← index + 1
ENDWHILE
carriages ← max / 50
```

12 (a) Complete the trace table (**Table 6**) for this program.

[6 marks]

Table 6

carriages	total	max	index
0	**0**	**0**	**1**

12 (b) Write an algorithm (using either **pseudocode** or a **flowchart**) that calculates the amount of fuel a train will need to complete a journey. The algorithm must:

- ask the user how many kilometres the journey will be
- only continue if the user enters a value greater than zero
- set the amount of fuel to a number 100 times greater than the number of kilometres
- not allow the amount of fuel to be less than 1500
- finally, display the amount of fuel needed.

[7 marks]

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13

END OF QUESTIONS

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED