OCR
Oxford Cambridge and RSA

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

Thursday 17 May 2018 – Afternoon
Time allowed: 1 hour 30 minutes

Do not use:
• a calculator
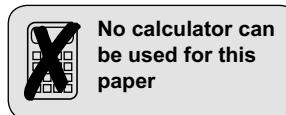
First name	
Last name	

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 barcodes.

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

No calculator can be used for this paper

OCR is an exempt Charity

Turn over

2

Answer **all** the questions.

1 OCR High School uses a computer system to store data about students' conduct. The system records good conduct as a positive number and poor conduct as a negative number. A TRUE or FALSE value is also used to record whether or not a letter has been sent home about each incident.

An example of the data held in this system is shown below in Fig. 1:

StudentName	Detail	Points	LetterSent
Kirstie	Homework forgotten	−2	FALSE
Byron	Good effort in class	1	TRUE
Grahame	100% in a test	2	FALSE
Marian	Bullying	−3	TRUE

Fig. 1

(a) State the most appropriate data type used to store each of the following items of data.

- StudentName ....

- Points ....

- LetterSent ....
[3]

(b) The data shown above in Fig. 1 is stored in a database table called **Conduct**.

(i) Write an SQL statement to select the StudentName field for all records that have negative Points.

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.... [3]

(ii) State the wildcard that can be used in SQL to show all fields from a table.

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.... [1]

3

(c) A single record from this database table is read into a program that uses an array with the identifier `studentdata`. An example of this array is shown below:

```
studentdata = ["Kirstie", "Homework forgotten", "-2", "FALSE"]
```

The array is zero based, so `studentdata[0]` holds the value "Kirstie".

Write an algorithm that will identify whether the data in the `studentdata` array shows that a letter has been sent home or not for the student. The algorithm should then output either "sent" (if a letter has been sent) or "not sent" (if a letter has not been sent).

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.... **[4]**

4

2   A programmer has written an algorithm to output a series of numbers. The algorithm is shown below:

```
01  for k = 1 to 3

02      for p = 1 to 5

03          print (k + p)

04      next p

05  next k

06  m = 7

07  print m * m
```

(a) (i)   Give the first **three** numbers that will be printed by this algorithm.

.... **[1]**

(ii)   State how many times line **03** will be executed if the algorithm runs through once.

.... **[1]**

(b) Identify **two** basic programming constructs that have been used in this algorithm.

1 ....

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2 ....

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    [2]

(c) (i)   Describe what is meant by a variable.

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.... **[2]**

(ii)   Identify **two** variables that have been used in the algorithm above.

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2 ....
    [2]

3 The logic diagram below (Fig. 2) shows a system made up of two connected logic gates.
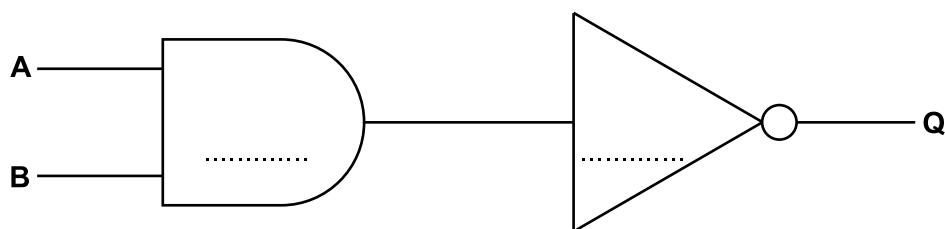
Fig. 2

(a) (i) Label the names of the two gates on the diagram above. **[2]**

(ii) Complete the truth table below to show the output from this logic system.

A	B	Q
0	0	
0	1	
1	0	
1	1	

[4]

(b) Draw the logic diagram represented by **Q = A ∨ ¬B**

[2]

6

4   A library gives each book a code made from the first three letters of the book title in upper case, followed by the last two digits of the year the book was published.

For example, "Poetry from the War", published in 2012 would be given the code POE12.

(a) (i)   Complete the following pseudocode for a function definition that will take in the book title and year as parameters and return the book code.

```
01  function librarycode(title, ……………………………………………)

02      parta = title.subString(0, …………………………………………)

03      partb = year.subString(2, 2)

04      ………………………………………… parta.upper + partb

05  endfunction
```

[3]

(ii) Use pseudocode to write an algorithm that does the following :

• Inputs the title and year of a book from the user.
• Uses the librarycode function above to work out the book code.
• Permanently stores the new book code to the text file bookcodes.txt

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(b) Functions and procedures are both examples of sub programs.

    (i) Describe **one** difference between a function and a procedure.

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.... **[2]**

    (ii) Describe **two** benefits to a programmer of using sub programs.

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.... **[4]**

8

(c) The library sorts their books based on the book code.

(i) Show the steps that a merge sort would take to put the following list of book codes into ascending alphabetical order (from A to Z).

`POE12 , BAC97 , FLY77 , JAV16 , TAL86 , AND18 , ZAR09 , HOP86`

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.... **[4]**

(ii) Explain **one** advantage of a merge sort compared to a bubble sort.

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.... **[2]**

5 **(a)** **(i)** Convert the denary number **132** into an 8 bit binary number.

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.... **[2]**

(ii) Convert the binary number **10110101** to its hexadecimal equivalent.

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.... **[2]**

(iii) Show the effect of a binary shift right of two places on the binary number **00110100**.

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.... **[1]**

(iv) Describe a shift that can be used to double the value of the binary number **00100100**.

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.... **[2]**

(b) The table below (Fig. 3) shows the ASCII codes for a number of characters.

The lower case ASCII code for a character can be found by adding **0100000** to the upper case version.

Character	ASCII code
R	1 0 1 0 0 1 0
r	1 1 1 0 0 1 0
A	1 0 0 0 0 0 1
a	
E	1 0 0 0 1 0 1
e	

Fig. 3

(i) Complete the table above by filling in the missing ASCII codes. **[2]**

(ii) Compare the use of ASCII and Extended ASCII to represent characters.

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.... **[2]**

6   An infinite loop is where a section of a program repeats indefinitely.

   (a) For each of the pseudocode algorithms shown below, tick the appropriate box to show whether they will loop infinitely or not.

Pseudocode	Will loop infinitely	Will <u>not</u> loop infinitely

`01  x = 0`
`02  while True`
`03      print x`
`04  endwhile`		

`01  x = 0`
`02  while x < 10`
`03      print x`
`04  endwhile`		

`01  x = 0`
`02  while x < 10`
`03      print x`
`04      x = x + 1`
`05  endwhile`		

`01  y = 5`
`02  for x = 1 to y`
`03      print x`
`04  next`		

[4]

   (b) Using pseudocode, write an algorithm that will use a count-controlled loop to print out the numbers 1 to 10 in ascending order.

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   .... **[3]**

7   Victoria is writing a program using a high level language to display the meaning of computer science acronyms that are entered. The code for her first attempt at this program is shown below.

```
01  a = input("Enter an acronym")

02  if a == "LAN" then

03      print("Local Area Network")

04  elseif a == "WAN" then

05      print("Wide Area Network")

06  ..................................................................................................

07  ..............................................................................................

08  endif
```

(a) (i) Complete the code above to print out an "unknown" message if any other acronym is entered by the user.   **[2]**

(ii) Describe what is meant by a "high level language".

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.... **[2]**

(b) Victoria creates her program using an Integrated Development Environment (IDE).

Describe two tools or facilities that an IDE commonly provides.

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.... **[4]**

8 OCR town are holding an election with three candidates (A, B and C). An electronic voting booth will be used to allow people to vote.

Write an algorithm that:

- Allows voters to enter either A, B or C.
- Keeps track of how many times each candidate has been voted for.
- As soon as one person has finished voting, allows the next person to vote.
- At any point allows the official to type in "END", which will print out the number of votes for each candidate and the total number of votes overall.

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END OF QUESTION PAPER

14

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

15

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