UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

4991324730

COMPUTING **9691/23**

Paper 2 **May/June 2012**

2 hours

Candidates answer on the Question Paper.

No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **13** printed pages and **3** blank pages.

For Examiner's Use

1 Anna wants to find out about her fellow students' sporting activities. It will be part of her Sports Studies coursework.
She will ask questions online, so starts by designing a screen layout. The first four questions will ask for:

- student's first name
- age (16,17,18 or 19)
- favourite sport
- whether student is a member of a sports club (yes/no)

(a) Draw a suitable screen layout.

[4]

(b) Justify the design of your screen layout in **(a)**.

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..... [3]

For Examiner's Use

(c) Several of the students are visually impaired.
Describe the design issues that Anna should consider to ensure these students can answer the questions online.

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..... [2]

(d) The responses from each student will be stored as a record consisting of the following fields:

- FirstName
- Age
- FavouriteSport
- ClubMember

Complete the following table. Only a single value should be given for the Field Size.

Field Name	Data Type	Field Size (bytes)
FirstName		
Age		
FavouriteSport		
ClubMember		

[8]

(e) Anna is to write a program to analyse the responses.

For Examiner's Use

Using a SELECT/CASE construct write the pseudocode to count the number of students for each age group who completed the questionnaire.

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```
REPEAT
    READ next record
```

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```
UNTIL no more student records
```

[5]

For Examiner's Use

(f) The records will be held in a direct access file.
Give **four** statements from a high-level programming language that may be used for the file handling and explain what each does.

Programming language .....

1 .....

.....

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2 .....

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3 .....

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4 .....

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..... [8]

For Examiner's Use

2 Gina is developing her programming skills in string handling.
She is going to input one string.
The string contains letters and zero or more '*' characters in any positions.
Gina wants to remove all the '*'s and output the letters in their original order.
For example:

- input "com*put**er*", the output is "computer"
- input "hardware", the output is "hardware"

(a) Using a high-level programming language, write the code to perform this task. (Ensure that you use meaningful variable names and lay the code out clearly.)

Programming language ....

Code ....

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.... [8]

For Examiner's Use

(b) She writes this code as the function `ChangeString` because it will be used several times.

(i) State the parameter of the function.

.....

..... [1]

(ii) Write the function header in the language you used in **(a)**.

.....

..... [2]

(iii) State why Gina uses a function rather than a procedure.

.....

..... [1]

For Examiner's Use

3 Liliane wants to write a program to play chess. She will represent the board of 8 x 8 squares, using the 2-dimensional array `Board[8,8]`.
Each element of the array will need initialising to zero. Later, if a chess piece is on a square, it will take a value of 1.
She starts by writing pseudocode for the initialisation of a 4 x 4 board. This is easier to trace.

```
01                  RowNo ← 1
02                  WHILE RowNo < 4 DO
03                      ColumnNo ← 1
04                      WHILE ColumnNo < 4 DO
05                          Board[RowNo,ColumnNo] ← 0
06                          ColumnNo ← ColumnNo + 1
07                      ENDWHILE
08                      RowNo ← RowNo + 1
09                  ENDWHILE
```

(a) To test this pseudocode she traces it until the first five elements of `Board` have been initialised.

Complete the headings and the trace for these first five elements of the array.

RowNo	ColumnNo	RowNo<4	ColumnNo<4	Board				
				[1,1]				
1	1	True	True	0				

[5]

For Examiner's Use

(b) There is an error in the pseudocode.

State the type of error.

.....

[1]

(c) Rewrite **two** lines that will make the pseudocode work as intended.

Line number	Pseudocode
.....	.....
.....	.....

[2]

(d) State the count-controlled loop that would be better for this initialisation.

.....

.....

[1]

(e) On a full 8 x 8 board, state the relative positions of the squares `Board[1,8]` and `Board[8,1]`.

.....

.....

[1]

(f) Liliane's next task is to indicate that there are pieces occupying the first two rows of the 8 x 8 board.
Each square in rows 1 and 2 will be given the value 1.

Draw a flowchart that shows how to do this, using loop structures and the variable names previously used (`Board`, `RowNo`, `ColumnNo`).

For Examiner's Use

[5]

For Examiner's Use

4 Raul writes software for a palm oil processing plant. He wants to check his understanding of different arithmetic operators for a problem that he has to solve.

(a) Evaluate the following expressions for Raul.

(i) 7/4 .....

(ii) 7 MOD 4 .....

(iii) 7 DIV 4 ..... [3]

(b) Raul has Y litres of oil to put into drums. Each drum can hold X litres of oil.

Write expressions to calculate:

(i) the number of full drums

.....

..... [1]

(ii) the number of litres of oil left over

.....

..... [1]

(c) Explain the difference between the operators / and DIV.

.....

.....

.....

..... [2]

5 Ramon is learning about recursion. He has designed a recursive function.

For Examiner's Use

```
FUNCTION Something(Number)
   IF Number = 7
      THEN
         Something ← 1
      ELSE
         Something ← Something(Number + 1) + Number
   ENDIF
ENDFUNCTION
```

(a) Calculate the value returned by the function call `Something(4)`.
Show your working.

`Something(4)` = ... [6]

(b) State what will happen if the function is called with `Something(8)`.

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..... [1]

(c) State what would happen if the fourth line, '`Something ← 1`', was not present.

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..... [2]

(d) The same process could have been designed using a FOR loop.
Write the pseudocode to do this.

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..... [2]

For Examiner's Use

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