Cambridge International A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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COMPUTING **9691/23**

Paper 2 **May/June 2014**

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, 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 **12** printed pages.

CAMBRIDGE International Examinations

1 (a) Sheena has inherited a recipe book from her grandmother. All the recipes give ingredient measurements in ounces. Sheena wants to write a program to produce a conversion table that helps her use the correct weight in grams.

To convert ounces into grams: 1 ounce is 28.35 grams.

The conversion table will show the number of grams to the nearest whole number:

Conversion Table	
Ounces	Grams
1	28
2	57
:	:
:	:
16	454

(i) Sheena writes pseudocode that uses the variables in the table below. Complete the identifier table.

Identifier	Data type	Description
`Ounces`		Variable used as control variable in `FOR` loop
`Grams`		Variable used for storing result of conversion calculation

[2]

(ii) The built-in function `ROUND(x)` returns `x` rounded to the nearest whole number.

Complete the pseudocode to print the conversion table for 1 to 16 ounces:

```
OUTPUT "   Conversion Table"
OUTPUT "Ounces           Grams"
FOR Ounces ← .....
  Grams ← .....
  ..... ← ROUND(Grams)
  OUTPUT Ounces,"               ", Grams
.....
```

[4]

(b) Sheena wants to write a function to return the number of boxes of eggs that she needs to buy. The function takes, as a parameter, the number of eggs required for a recipe. There are 6 eggs in a box. Sheena needs to buy enough eggs, but does not want any full boxes of eggs left over.
She knows that she can use the operators `DIV` and `MOD` to calculate the required number of boxes.

(i) Show the results for the following expressions:

`20 DIV 6 =` .....

`20 MOD 6 =` ..... [2]

(ii) Complete the pseudocode:

```
FUNCTION CalculateNumberOfBoxes(NumberOfEggs : .....  )
                                          RETURNS .....
  DECLARE ..... : INTEGER
  NumberOfBoxes ← ..... // how many full boxes?
  IF NumberOfEggs MOD ..... // need part of a box?
    THEN                                  // increment number of boxes
      .....
  ENDIF
  RETURN NumberOfBoxes
ENDFUNCTION
```
[5]

(c) Sheena could have written the algorithm in **part (a)(ii)** as a procedure.
What is the difference between a function and a procedure?

.....

..... [1]

(d) All programs should be maintainable. Sheena has followed good practice in writing her pseudocode. She has used features of maintainable programs.

List **four** such features.

1 .....

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2 .....

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3 .....

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4 .....

..... [4]

2 Sheena wants to set up a business selling home-made cakes. She wants customers to order online. She needs to know:

- customer's name
- customer's contact telephone number
- the date the cake is to be ready
- the type of cake
  - fruit cake
  - victoria sponge
  - gateau
  - cheesecake
- whether the cake is to be delivered or not.

(a) (i) Draw a suitable screen layout for a customer to order a cake online.

[4]

(ii) Justify **one** feature of your design above.

.....

..... [1]

(b) Sheena wants to store the data for each order as a record consisting of the following fields:

- `CustomerName`
- `TelephoneNumber`
- `DateReady`
- `CakeType` (`F`, `V`, `G` or `C`)
- `Price` (`$`)
- `ToBeDelivered`

(i) Complete the following table of fields for the `CakeOrder`. Give **one** value for each field size.

Field name	Data type	Field size (bytes)
`CustomerName`		
`TelephoneNumber`		
`DateReady`		
`CakeType`		
`Price`		
`ToBeDelivered`		

[8]

(ii) Using a high-level programming language, declare a record structure for the fields defined in **part (b)(i)**.

Language .....

Code .....

.....

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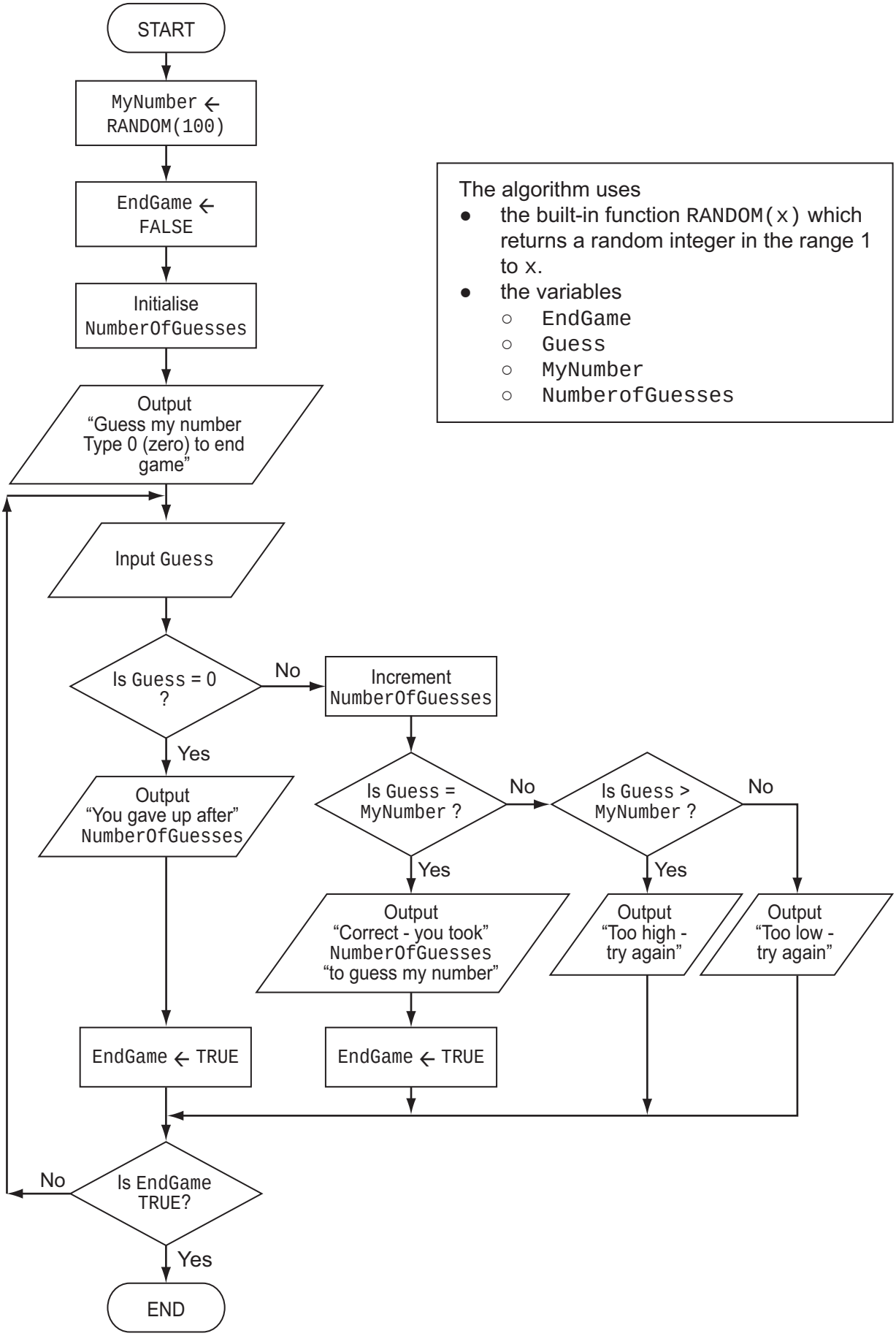
..... [4]

Question 3 begins on page 8.

3 Raza wants to write a number-guessing game. He has drawn a flowchart of an algorithm:



In a high-level language write programming statements to implement the algorithm.

Language ....

Code ....

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.... [18]

4 A puzzle starts with a partially completed grid of digits. A player must fill a 9×9 grid with single digits so that each column, each row, and each of the nine 3×3 sub-grids contain all of the digits from 1 to 9.

Each puzzle has a unique solution.
Below is an example of a puzzle and its solution:

PUZZLE

8		**5**						**7**
9			**5**		**4**			
4	**1**			**6**				
			7			**1**	**6**	
1			**4**		**6**			**3**
	5	**8**			**1**			
				1			**4**	**9**
			2		**7**			**1**
2						**5**		**6**

SOLUTION

8	*6*	**5**	*1*	*9*	*2*	*4*	*3*	**7**
9	*3*	*2*	**5**	*7*	**4**	*6*	*1*	*8*
4	**1**	*7*	*8*	**6**	*3*	*9*	*5*	*2*
3	*2*	*4*	**7**	*8*	*9*	**1**	**6**	*5*
1	*7*	*9*	**4**	*5*	**6**	*8*	*2*	**3**
6	**5**	**8**	*3*	*2*	**1**	*7*	*9*	*4*
7	*8*	*3*	*6*	**1**	*5*	*2*	**4**	**9**
5	*9*	*6*	**2**	*4*	**7**	*3*	*8*	**1**
2	*4*	*1*	*9*	*3*	*8*	**5**	*7*	**6**

Raul wants to write a program that displays the puzzle and allows the user to enter digits to attempt a solution.

(a) Describe the type of interface needed so that the user can enter digits on screen.

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..... [2]

(b) The program needs to store the puzzle.

(i) Describe the data structure required.

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..... [2]

(ii) Using the data structure you described in **part (b)(i)**, give the pseudocode assignment statement that stores the 5 in the top row of the example shown.

..... [2]

(c) When the user enters a character, the program needs to check it is a digit.

The character is stored in the character variable `Entry`.

Write the Boolean expression required to check that it is a digit.

.....

..... [2]

(d) Raul wants the user to be able to use an "undo" option to clear the previous entry if they think they have made an error.

The "undo" option can be used repeatedly to return to a previous state of the puzzle.

Describe a method of storing the entries to allow for this.

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..... [4]

5 Raul copied the following pseudocode from a computing textbook. He wants to find out what it does.

(i) Dry run the pseudocode using the trace table.

```
FOR x ← 2 TO 4
  ThisValue ← List[x]
  y ← x - 1
  WHILE (List[y] > ThisValue) AND (y > 0)
    List[y + 1] ← List[y]
    y ← y - 1
  ENDWHILE
  List[y + 1] ← ThisValue
ENDFOR
```

x	ThisValue	y	List[y]	(List[y] > ThisValue) AND (y > 0)	List			
					[1]	[2]	[3]	[4]
–	–	–	–	–	56	23	67	12
2	23	1	56	TRUE				

[9]

(ii) What does this pseudocode do?

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..... [1]