

CANDIDATE
NAME

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CENTRE
NUMBER

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NUMBER

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COMPUTING

9691/21

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.

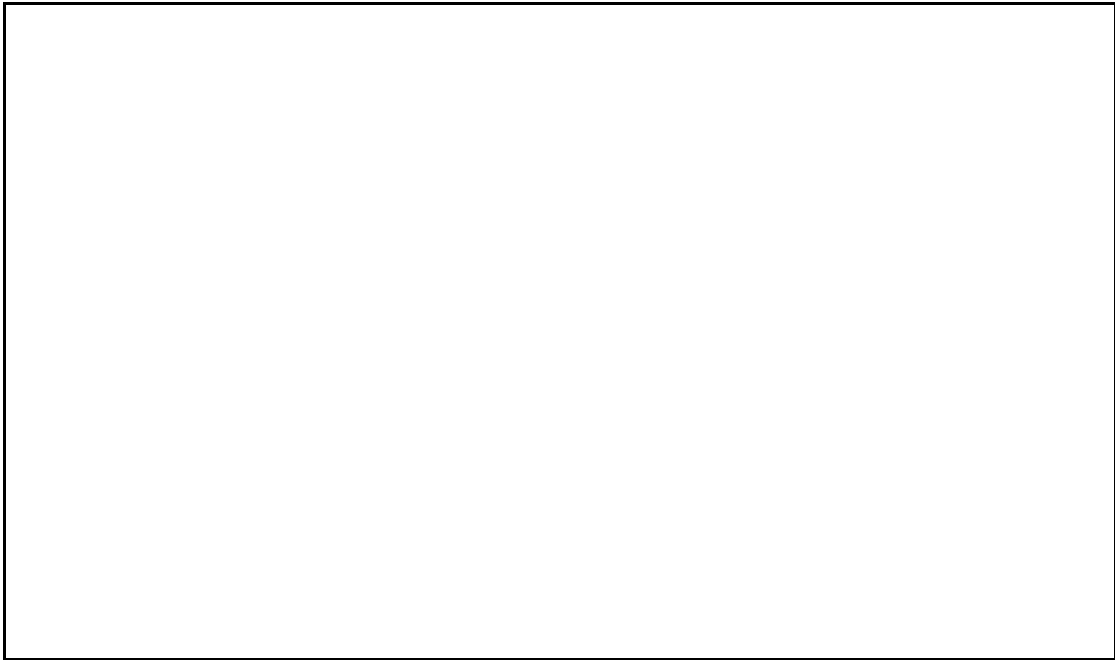
The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **11** printed pages and **1** blank page.



1 A teacher wants to write a program to help young children learn their multiplication tables.

(a) (i) Draw a suitable layout for the initial screen to let a child choose which multiplication table between 1 and 10 they want to learn.



[3]

(ii) Explain how the child can choose a number using your screen design in part (a)(i).

.....
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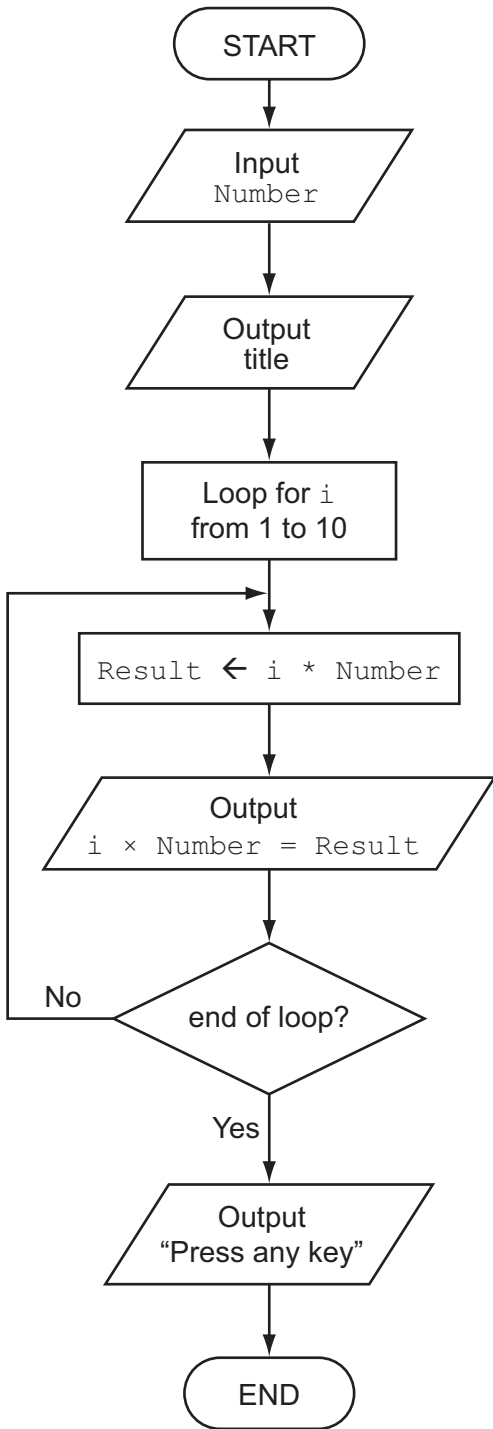
[1]

(b) If the child chooses the number 7, the screen displays:

```
7 Times Table
=====
1 x 7 = 7
2 x 7 = 14
3 x 7 = 21
4 x 7 = 28
5 x 7 = 35
6 x 7 = 42
7 x 7 = 49
8 x 7 = 56
9 x 7 = 63
10 x 7 = 70

Press any key
```

The algorithm to produce this output is represented by the flowchart below:



The program needs the following three integer variables:

- Number
- i
- Result

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

Language

Code

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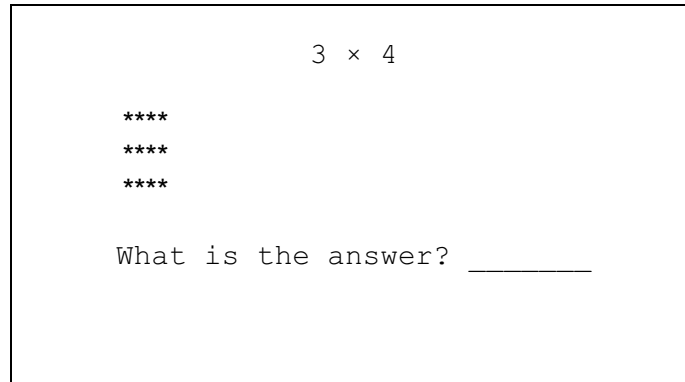
.....

.....

..... [6]

- (c) The teacher wants the program to:
- show a visual representation of a multiplication
 - ask the child to key in an answer.

For example, the multiplication of 3×4 is represented as shown.



This grid of asterisks (*) is produced by the procedure call:

```
ShowMultiplicationGrid(3, 4)
```

Complete the pseudocode for this procedure:

```
PROCEDURE ShowMultiplicationGrid(Number1, Number2)
```

```
FOR Row ← .....
```

```
FOR Column ← .....
```

```
  OUTPUT .....
```

```
  .....
```

```
  .....
```

```
ENDFOR
```

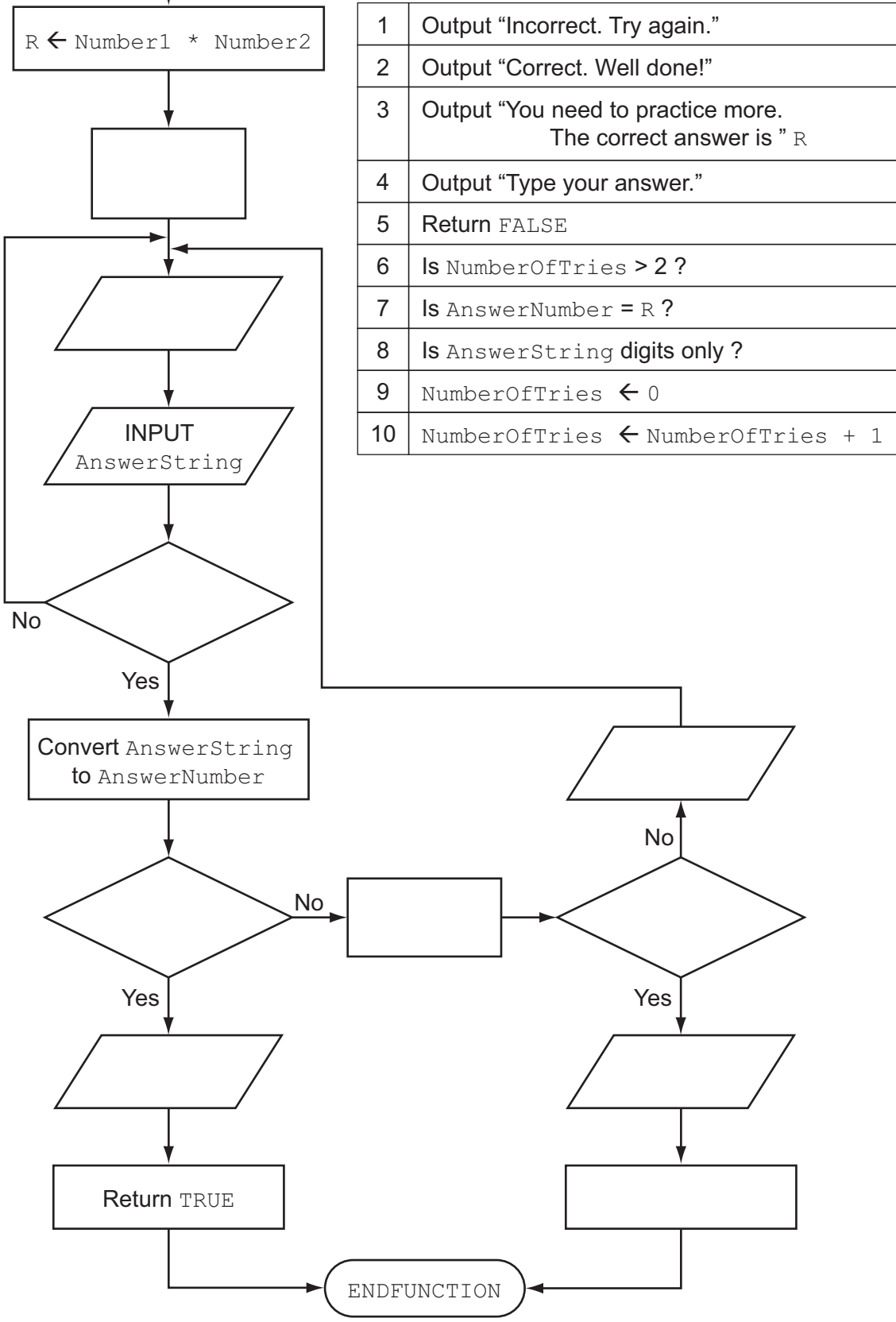
```
ENDPROCEDURE
```

[5]

- (d) The function `CheckAnswerCorrect` gives the child three chances to type in the correct answer. The function returns `TRUE` if the child typed the correct answer, and `FALSE` if all three attempts are incorrect.

Complete the flowchart opposite, using the given statements. Label each blank symbol with the correct statement number.

FUNCTION
CheckAnswerCorrect (Number1, Number2)



1	Output "Incorrect. Try again."
2	Output "Correct. Well done!"
3	Output "You need to practice more. The correct answer is " R
4	Output "Type your answer."
5	Return FALSE
6	Is NumberOfTries > 2 ?
7	Is AnswerNumber = R ?
8	Is AnswerString digits only ?
9	NumberOfTries ← 0
10	NumberOfTries ← NumberOfTries + 1

- 2 The teacher wants a new program to test children. A sequence of multiplication questions is displayed. If a child inputs 3 incorrect answers for a question, the program outputs the number of questions the child answers correctly. Then the program stops.

The program design uses the following functions and procedures.

Function or procedure name	Description
Random(X)	A function that returns a whole number in the range 1 to X inclusive
Display(Number1, Number2)	A procedure that produces the output $5 \times 8 = \quad ?$ when Number1 is 5 and Number2 is 8
CheckAnswerCorrect(Number1, Number2)	The procedure from Question 1(d)
TestScoreTotal	A function that returns the number of questions answered correctly

- (a) Complete the pseudocode:

```

FUNCTION TestScoreTotal RETURNS .....
    DECLARE AnswerCorrect, ..... : BOOLEAN
    DECLARE ..... , ..... , ..... : INTEGER
    ..... // initialise Score
    Finish ← FALSE
    REPEAT
        Number1 ← ..... // generate two
        Number2 ← ..... // numbers
        Display(Number1, Number2)
        AnswerCorrect ← CheckAnswerCorrect(Number1, Number2)
        IF ..... // was answer correct?
            THEN Score ← Score + 1
            ELSE ..... // flag set to stop program
        ENDIF
    UNTIL ..... // is flag set?
    RETURN ..... // return the number of
    ..... // questions answered correctly
ENDFUNCTION

```

[9]

(b) During the school day, several children in the class will use this program. The teacher wants to store each child’s name and their best test score so far.

Assume there will be no more than 30 children in the class.

(i) Two one-dimensional arrays, `Name` and `BestScore`, are to store the name and score for each child in the class.

Use a high-level programming language to declare these **two** arrays.

Language

Code

..... [2]

(ii) Alternatively, the data for one child could be stored in a record `StudentScore`.

Use a high-level programming language to declare `StudentScore`.

Language

Code

.....

.....

..... [2]

(iii) Use the same programming language as in **part (b)(ii)** to declare a one-dimensional array of records to store the data for the whole class. Use the identifier `Student`.

.....

..... [2]

(iv) Write the program statements to assign the following values to the third record in the array:

- Name: ‘Anji’
- Score: 15

.....

..... [3]

4 Look at this pseudocode function:

```

FUNCTION Y(s : STRING) RETURNS STRING
  DECLARE x : INTEGER
  x ← LENGTH(s)
  IF x = 1
    THEN
      RETURN s
    ELSE
      RETURN Y(RIGHT(s, x - 1)) + LEFT(s, 1)
      // RIGHT above returns rightmost x - 1 characters of string s
      // LEFT above returns leftmost character of string s
  ENDIF
ENDFUNCTION
    
```

(i) How can you tell that function Y is recursive?

.....
 [1]

(ii) Dry-run the function when it is called with the string 'BYTE' as parameter.

Call Number	Function call	s	x	RIGHT (s, x - 1)	LEFT (s, 1)	Return value
1	Y ('BYTE')	'BYTE'				

[7]

(iii) What does function Y do?

.....
 [1]

(iv) List **two** features of the pseudocode above that make it easier to understand.

- 1 [2]
- 2 [2]

(v) List **one** feature of the pseudocode above that makes it more difficult to understand.

1 [1]

(vi) Re-write the pseudocode function as an iterative function.

FUNCTION Y(s : STRING) RETURNS STRING

.....
.....
.....
.....
.....
.....
.....
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.....
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.....

ENDFUNCTION

[5]

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