CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2014 series

9691 COMPUTING

9691/21   Paper 2 (Written Paper), maximum raw mark 75

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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1 (a) (i) *Mark as follows:*

1 mark for heading/introduction
1 mark for method of displaying numbers 1 – 10
   e.g. dropdown box/radio buttons/grid of numbers)
   1 mark for method to move to next screen (ignore exit/cancel) (accept next/ok/enter)
   e.g. button // a label telling child what to do   [3]

(ii) 1 mark for explanation that fits design of (a)(i)   [1]
   e.g. clicking on/touching/pressing button/box/number/icon

(b) Mark as follows:

- 1 mark for each box correctly translated into chosen programming language
- Identifiers must be the same as given in flowchart
- Give 1 mark for loop header and end correctly coded (must be a FOR loop)
- Ignore any declarations
- If candidate only says "Visual Basic" (no version number) use the mark scheme that best fits the answer
- If language given is "Pseudocode", give no marks

[max 6]

VB6 – accept console mode answers

```
Number = InputBox("")
Msg = Number & " Times Table" & vbCrLf
For i = 1 To 10
    Result = i * Number
    Msg = Msg & i & "x" & Number & "=" & Result & vbCrLf
Next i
Msg = Msg & "Press any key"
MsgBox(Msg)
```

VB.NET/VB 2005 *etc.*

```
Number = Console.ReadLine();
Console.WriteLine(Number & " Times Table");
For i = 1 To 10
Result = i * Number
Console.WriteLine(i & "x" & Number & "=" & Result)
Next i
Console.WriteLine("Press any key")
```

QBASIC

```
INPUT Number;
PRINT Number; " Times Table"
FOR i = 1 TO 10
    Result = i * Number
    PRINT i; "x"; Number; "="; Result
NEXT i
PRINT "Press any key"
```

PASCAL

```
ReadLn(Number);
WriteLn(Number, ' Times Table');
For i := 1 To 10 Do
Begin
    Result := i * Number;
    WriteLn(i, 'x', Number, '=', Result);  // semicolon optional here
End;                                // Begin End are part of the loop
structure
WriteLn('Press any key');
```

PYTHON

```
Number = int(input())
print(Number, "Times Table")
for i in range(1,11) :
    Result = i * Number
    print(i, "x", Number, "=", Result)
print("Press any key")
```

(c)
```
PROCEDURE ShowMultiplicationGrid (Number1, Number2)
    FOR Row ← 1 TO Number1          // 1 mark    ⎤ 1 mark if Number1 and
        FOR Column ← 1 TO Number2   // 1 mark    ⎦ Number2 switched
                                                   round
            OUTPUT '*'      // 1 mark – accept '*' or "*"
        ENDFOR                      // 1 mark – accept NEXT column
        OUTPUT NewLine              // 1 mark – must be in outer loop
    ENDFOR
ENDPROCEDURE
```
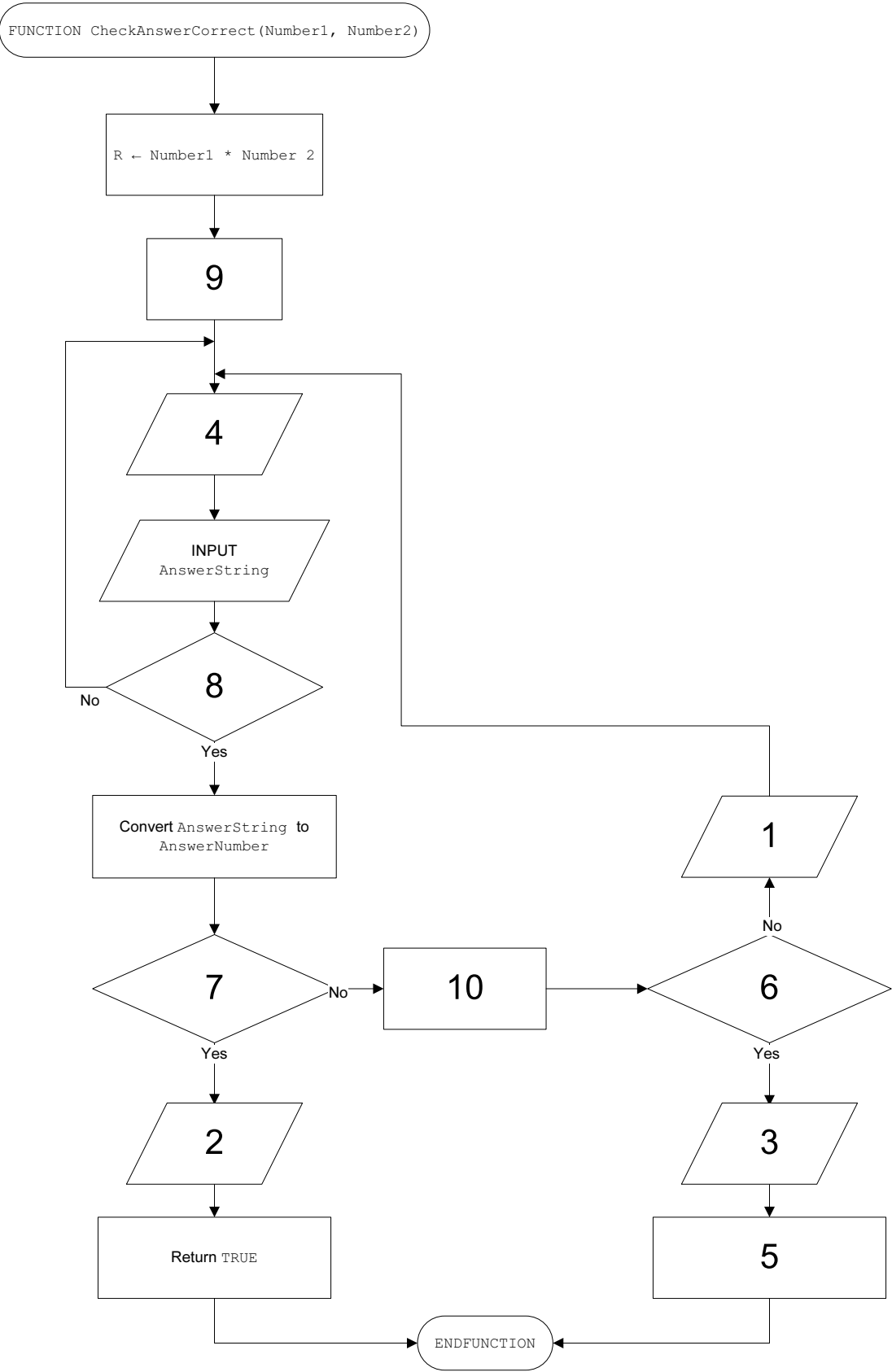[5]

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(d) 1 mark for each correctly labelled shape (accept full text instead of number)

FUNCTION CheckAnswerCorrect(Number1, Number2)

R ← Number1 * Number 2

9

4

INPUT
AnswerString

8

No

Yes

Convert AnswerString to
AnswerNumber

1

7

No

10

6

No

Yes

Yes

2

3

Return TRUE

5

ENDFUNCTION

[10]

(2) (a)
```
FUNCTION TestScoreTotal RETURNS INTEGER              // 1 mark
     DECLARE AnswerCorrect, Finish : BOOLEAN          // 1 mark
     DECLARE Number1, Number2, Score : INTEGER  // 1 mark
     Score ← 0                                        // 1 mark

     Finish ← FALSE
     REPEAT
       Number1 ← Random(10)           // accept X instead of 10
       Number2 ← Random(10)           // 1 mark
       Display(Number1, Number2)
       AnswerCorrect ← CheckAnswerCorrect(Number1, Number2)
       IF AnswerCorrect = TRUE                        // 1 mark
          THEN Score ← Score + 1
          ELSE Finish ← TRUE                          // 1 mark
       ENDIF                                           // accept =
instead of ←
       UNTIL Finish = TRUE                            // 1 mark
       RETURN Score                                    // 1 mark
ENDFUNCTION
```
[9]

- If candidate only says "Visual Basic" (no version number) use the mark scheme that best fits the answer
- If language given is "Pseudocode", give no marks
- Identifiers must be as given in the question

Mark as follows:

(b) (i) 2 marks
- Correct dimension 1 mark
- Correct data types 1 mark   [2]

(ii) 2 marks
- 1 mark for structure
- 1 mark for correct fields (Name, BestScore) listed   [2]

(iii) 2 marks
- 1 mark for correct name (Student) and size
- 1 mark for correct record type (StudentScore)   [2]

(iv) 3 marks
- 1 mark for correctly addressed array elements (Student(3))
- 1 mark for correct reference to individual fields (.Name, .BestScore)
- 1 mark for correct assignment of values   [3]

VB6

QUESTION 2(b)(i)

```
Dim Name(30) As String
Dim BestScore(30) As Integer
```

QUESTION 2(b)(ii)

```
Type StudentScore
      Name As String
      BestScore As Integer
End Type
```

QUESTION 2(b)(iii)

```
Dim Student(30) As StudentScore
```

QUESTION 2(b)(iv)

```
Student(3).Name = "Anji"
Student(3).BestScore = 15
```

VB.NET/VB 2005 *etc.*

QUESTION 2(b)(i)

```
Dim Name(30) As String
Dim BestScore(30) As Integer
```

QUESTION 2(b)(ii)

```
Structure StudentScore
      Dim Name As String
      Dim BestScore As Integer
End Structure
```

QUESTION 2(b)(iii)

```
Dim Student(30) As StudentScore
```

QUESTION 2(b)(iv)

```
Student(3).Name = "Anji"
Student(3).BestScore = 15
```

QBASIC

QUESTION 2(b)(i)

```
DIM Name(30) AS STRING * 15
DIM BestScore(30) AS INTEGER
```

QUESTION 2(b)(ii)

```
TYPE StudentScore
      Name AS STRING * 15
      BestScore AS INTEGER
END TYPE
```

QUESTION 2(b)(iii)

```
DIM Student(30) AS StudentScore
```

QUESTION 2(b)(iv)

```
Student(3).Name = "Anji"
Student(3).BestScore = 15
```

PASCAL

QUESTION 2(b)(i)

```
Name : Array[1..30] Of String;
BestScore : Array[1..30] Of Integer;
```

QUESTION 2(b)(ii)

```
Type StudentScore = Record
          Name : String[15];
          BestScore : Integer;
      End;
```

QUESTION 2(b)(iii)

```
Student : Array[1..30] Of StudentScore;
```

QUESTION 2(b)(iv)

```
Student[3].Name := 'Anji';
Student[3].BestScore := 15;
```

PYTHON

QUESTION 2(b)(i)

```
Name = ["" for i in range(30)]
BestScore = [0 for i in range(30)]
```

or

```
Name = []
BestScore = []
for i in range(30) :
     Name.append("")
     BestScore.append(0)
```

QUESTION 2(b)(ii)

```
class StudentScore :
    def __init__(self) :
       Name = ""
       BestScore = 0
```

QUESTION 2(b)(iii)

```
Student = [StudentScore() for i in range(30)]
```

or

```
Student = []
for i in range(30) :
   Student.append(StudentScore())
```

QUESTION 2(b)(iv)

```
Student[2].Name = "Anji"
Student[2].BestScore = 15
```

Mark as follows:

- Procedure/sub SaveToFile
- Open (for writing) StudentFile
- Initialise index value correctly
- Loop through student array
- Write record to file StudentFile
- Close file StudentFile

(c) **VB6**

```
Sub SaveToFile()
    Dim i as Integer
    Open "StudentFile" For Output As #1
    For i = 1 To 30
        Write#1, Student(i).Name, Student(i).BestScore
    Next i
    Close#1
End Sub
```

VB.NET/VB 2005 *etc.*

```
Sub SaveToFile()
    Dim Writer As BinaryWriter
    Writer    =    new    BinaryWriter(File.Open("StudentFile",
                                                 FileMode.Create))
    For i = 1 To 30
        Writer.Write(Student(i).Name)
        Writer.Write(Student(i).BestScore)
    Next i
    Writer.Close()
End Sub
```

QBASIC

```
SUB SaveToFile(Student() AS StudentScore)
    OPEN "StudentFile" FOR OUTPUT AS #1
    FOR i = 1 TO 30
        WRITE #1, Student(i).Name, Student(i).BestScore
    NEXT i
    CLOSE #1
END SUB
```

PASCAL

```
Var Students : File Of StudentScore;
Procedure SaveToFile;
Var i : Integer;
Begin
    Assign(Students, 'StudentFile');
    Rewrite(Students);
    For i := 1 To 30 Do
        Write(Students, Student[i]);
    Close(Students);
End;
```

PYTHON

```python
import pickle
def SaveToFile() :
    Students = open("StudentFile", "wb")
    for i in range(30) :
        pickle.dump(Student[i], Students)
    Students.close()
```

or *(as a text file)*

```python
def SaveToFile() :
    Students = open("StudentFile", "w")
    for i in range(30) :
        Students.write(Student[i].Name + "\n")
        Students.write(str(Student[i].BestScore) + "\n")
    Students.close()
```
[6]

3 (a) (i)
```
FUNCTION FindArrayIndex(ChildName : STRING) RETURNS INTEGER
    i ← 0
REPEAT
    i ← i + 1
UNTIL Student[i].Name = ChildName
RETURN i
```

Another method:

```
FUNCTION FindArrayIndex(ChildName : STRING) RETURNS INTEGER
    Found ← FALSE
    i ← 1
    WHILE NOT (Found = TRUE)
        IF Student[i].Name = ChildName
            THEN Found ← TRUE
            ELSE i ← i + 1
        ENDIF
    ENDWHILE
RETURN i
```

[max 5]

(ii) *suggestion of checking for end of array*
// checking whole array and setting flag if not found
Special value/error code/number returned if name doesn't exist (e.g. –1)

[2]

(b) *e.g.*
– turn all characters into lower/upper case
– before saving/searching // on input

[2]

(4) (i) – it calls itself [1]

(ii)

Call Number	Function call	s	x	RIGHT (s,x - 1)	LEFT(s,1)	Return value
1	Y('BYTE')	'BYTE'	4	'YTE'		
2	Y('YTE')	'YTE'	3	'TE'		
3	Y('TE')	'TE'	2	'E'		
4	Y('E')	'E'	1			'E'
(3)					'T'	'ET'
(2)					'Y'	'ETY'
(1)					'B'	'ETYB'

1 mark per correct column [7]

(iii) reverses the string [1]

(iv) – indentation
comment/annotation/remarks [2]

(v) – identifiers not meaningful/sensible // identifiers are just single characters [1]

(vi) if answer is recursive, no marks

There are many different ways of solving this. The following are examples:

```
n ← "/empty string
REPEAT
  x ← LENGTH(s)
  z ← LEFT(s,1)
  s ← RIGHT(s, x - 1)
  n ← z + n          // y ← concat(z,n)
UNTIL s = "
RETURN n
```

Or

```
n ← "/empty string
x ← LENGTH(s)
FOR i ← 1 TO x
  z ← LEFT(s,1)
  s ← RIGHT(s, x - i)
  n ← z + n            // n ← concat(z,n)
ENDFOR
RETURN n

n ← "/empty string
x ← LENGTH(s)
FOR i ← 1 TO x
  z ← MID(s,i,1)
  n ← z + n            // n ← concat(z,n)
ENDFOR
RETURN n
```

Mark as follows:
– start with empty string
– correct loop structure
– correct loop count/termination
– pick single character (from string s) <u>consecutively</u>
– concatenate single character to <u>correct</u> end of new string
– return newly formed string

[5]