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Cambridge International AS & A Level

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COMPUTER SCIENCE **9608/22**

Paper 2 Written Paper **October/November 2016**

MARK SCHEME

Maximum Mark: 75

Published

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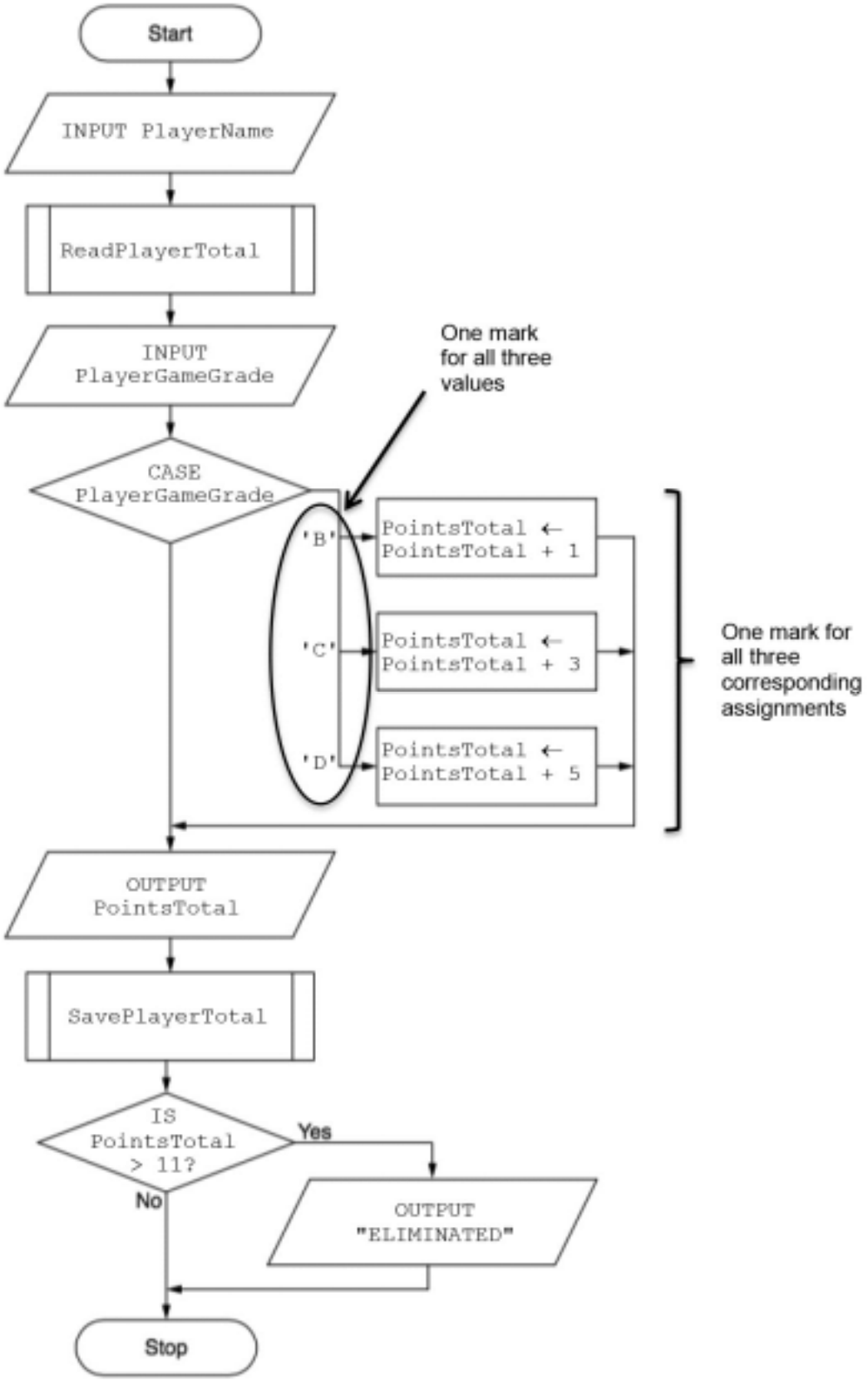
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Page 2	Mark Scheme	Syllabus	Paper
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1 (a)



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Mark as follows:

- One mark per shape, correctly labelled (except for three assignments as noted above)
- One mark for three selection values ('B', 'C' and 'D') [9]

(b)

PointsTotal	PlayerGameGrade	Updated	Output
n	A	n	n
n	B	n + 1	n + 1
n	C	n + 3	n + 3
n	D	n + 5	n + 5
e.g. 10	e.g. C	13	13 ELIMINATED

One mark per complete row testing **different** routes through the algorithm. [5]

(c)
```
INPUT PlayerGameGrade
WHILE NOT(PlayerGameGrade = 'A' OR
          PlayerGameGrade = 'B' OR
          PlayerGameGrade = 'C' OR
          PlayerGameGrade = 'D')
  OUTPUT "Invalid – Re-enter"
  INPUT PlayerGameGrade
ENDWHILE
```

One mark for each of:

- `WHILE ... ENDWHILE`
- Correct condition in a loop
- `INPUT` within loop plus one before loop // alternative arrangement leading to correct exit from loop [3]

2 (a) (i) 'e' [1]

(ii) "Cat-food" [1]

(iii) 213 [1]

(b) (i) 03 // 3 [1]

(ii) 29 [1]

(iii) 14 // 16 [1]

(iv) 18 // 24 // 25 [1]

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(c) `NextChar <> '*'` [1]

(d) (i)

					Numbers		
i	j	NextChar	NextNumberString		1	2	3
1	1	'2'					
			""				
			"2"				
	2	'3'	"23"				
	3	'*'			23		
2	**4**	**'7'**	**""**				
			"7"				
	5	**'3'**	**"73"**				
	6	**'1'**					
	7	**'*'**	**"731"**			**731**	
3	**8**	**'5'**	""				
	9	**'*'**	**"5"**				**5**
4	**10**	**'#'**					

One mark for each of columns 1 to 4
One mark for numbers 2 & 3 as shown in box [5]

(ii) One mark for each of:

- Isolates / separates / splits up each numeric string / the numbers / data string separated by '*'
- Converts each numeric string / each number into an integer and
- Stores each integer in array (`Numbers`) [Max. 2]

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3 (a) (i) Declaration of a variable // identifier [1]

(ii) `$TimesTable, // $UpTo // $Posn // $Product` [1]

(iii) 15 // 16 // 18 // 21 // 23 [1]

(iv) Statements inside the loop are enclosed by curly brackets {} // or by example, such as `{<statements>}` [1]

(b) (i)
- a learned / existing skill…
- … which can be applied to / used in a new situation / role [2]

(ii) The ability to recognise:
- Similar syntax
  - Assignment / variables / data types
  - Common operators / symbols for functions (+, –, /, *, OR, AND, >, <…)
- Control Structures
  - Iteration
  - Selection
  - Sequence
  - Layout / format (e.g. indentation)
- Modular features
  - Objects
  - Procedures / Functions

Any two of the above. [Max. 2]

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4 (a) `INT(RND() * 150 ) + 1`

One mark for each part as follows:

- `RND() * 150`
- `+ 1`
- `INT()` [3]

(b) 'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix.

Expected Loop-based solution:

```
DECLARE i , NextNumber : INTEGER
FOR i ← 1 TO 4
   NextNumber ← 1 + INT(Rnd() * 150)
   OUTPUT NextNumber
ENDFOR
```

Mark as follows:

- Declaration of all variables used including data types
- Loop
- Assignment / calculation of (four) different random numbers (0 to 150) <u>in a loop</u>
- Output of four values

ALTERNATIVE Non-Loop version

```
DECLARE Num1, Num2, Num3, Num4 : INTEGER

  Num1 ← INT(RND() * 150)) + 1
  Num2 ← INT(RND() * 150)) + 1
  Num3 ← INT(RND() * 150)) + 1
  Num4 ← INT(RND() * 150)) + 1

OUTPUT Num1, Num2, Num3, Num4
```

Mark as follows:

- Declaration of all variables used including data types
- Assignment of four different random numbers (0 to 150)
- Assignment to four separate variables
- Output of four values [4]

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(c) Visual Basic

```
Function GenerateNumber(ByVal AnyName AS INTEGER) AS INTEGER
```

Pascal

```
FUNCTION GenerateNumber (AnyName : INTEGER) : INTEGER
```

Python

```
def GenerateNumber (AnyName):
```

- Mark as follows:
- Correct keyword + Function name
- Single input parameter of correct type
- Return parameter type [3]

(d) (i)
- Program code is modified
- following a change to the requirements [2]

(ii)
- Use an array / list / file to store each number generated // a flag value
- Check the array / list / file to see if the new random number has already been drawn
- If YES, generate another number
- If NO, output the number and update the array / list / file [Max. 3]

5 (a)
- 2D array
- of type integer
- with identifier `PlayerScore` [Max. 2]

(b) (i) Stepwise refinement // Top-Down Design [1]

(ii) 'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix.

```
DECLARE ThisPlayerName : STRING
DECLARE PlayerName : ARRAY[1:8) OF STRING
DECLARE i : INTEGER

OPENFILE "NAMES.TXT" FOR READ
i ← 1

WHILE NOT EOF("NAMES.TXT")
  READFILE "NAMES.TXT", ThisPlayerName
  PlayerName[i] ← ThisPlayerName
  i ← i + 1
ENDWHILE

CLOSEFILE "NAMES.TXT"
```

One mark for each of:
- File open in read mode
- Loop until `EOF()` or count-controlled (8 iterations)
- Read a line from the file in a loop
- Assignment to `PlayerName[1 to 8]` from the file in a loop]

Close file [Max. 4]

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(iii) 'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix.

```
// search for player name ....
Found ← FALSE
i ← 1

REPEAT
  IF ThisPlayerName = PlayerName[i]
    THEN
      Found ← TRUE
      PlayerNumber ← i
    ELSE
      i ← i + 1
  ENDIF

UNTIL (Found = TRUE) OR (i = 9)
```

One mark for each of:
- Initialise `i` to 1 and Found to `FALSE`
- Loop through array `PlayerName` (including exit when found)
- Comparison: `ThisPlayerName = PlayerName[i]` in a loop
- `Found` set to `TRUE` if `ThisPlayerName` found [Max. 4]

(c) (i)
- a nested // an inner and an outer
- count controlled // incremented loop(s) [2]

(ii)

…	True
…	False

Both answers must be correct [1]

(iii) Error line number 5, 9 or 11 as follows:

Line 5:
The boundary value must be included //
`IF PlayerScore[GameIndex, PlayerIndex] >= 100 // > 99`

Line 9:
The boundary value must be included //
`IF PlayerScore[GameIndex, PlayerIndex] >= 50 // > 49`

Line 11:
One should be added to `Total50` (not `GameIndex`) //
`Total50 ← Total50 + 1`

One mark for line number + explanation [1]

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6 **(i)** 10 / 10.0 [1]

(ii) 18.4 [1]

(iii) 41 [1]

(iv) TRUE [1]

(v) 12.4 [1]

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Appendix – Program code example solutions

Q4 (b): Visual Basic

```
Randomize()
Dim i As Integer
Dim NextNumber As Integer
For i = 1 To 4
   NextNumber = 1 + Int(Rnd() * 150)
   Console.WriteLine(NextNumber)
Next
```

OR

```
Randomize()
Dim Num1, Num2, Num3, Num4 As Integer
Num1 = 1 + Int(Rnd() * 150)
Num2 = 1 + Int(Rnd() * 150)
Num3 = 1 + Int(Rnd() * 150)
Num4 = 1 + Int(Rnd() * 150)
Console.WriteLine(Num1, Num2, Num3, Num4)
```

Q4 (b): Pascal

```
Var i : Integer;
   NextNumber : Integer;
Begin
   Randomize;
   For i := 1 To 4 Do
   Begin
      NextNumber := 1 + Random(150);
      Writeln(NextNumber);
   End;
   Readln;
End.
```

OR

```
Var Num1, Num2, Num3, Num4 : Integer;
Begin
   Randomize;
   Num1 := 1 + Random(150);
   Num2 := 1 + Random(150);
   Num3 := 1 + Random(150);
   Num4 := 1 + Random(150);
   Writeln(Num1, Num2, Num3, Num4);
   Readln;
End.
```

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Q4 (b): Python

```
import random
# i : Integer
# NextNumber : Integer

for i in range(1, 5) :
   NextNumber = 1 + int(150 * random.random())
   print(NextNumber)
```

Alternative:

```
import random
# i Integer
# NextNumber Integer
for i in range(1, 5) :
   NextNumber = random.randint(1, 150)
   print(NextNumber)
```

OR

```
import random
# i Integer
# Num1, Num2, Num3, Num4 Integer

Num1 = random.randint(1, 150)
Num2 = random.randint(1, 150)
Num3 = random.randint(1, 150)
Num4 = random.randint(1, 150)

print(Num1, Num2, Num3, Num4)
```

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Q5 (b) (ii): Visual Basic

```
Dim PlayerName(8) As String
Dim i As Integer
FileOpen(1, "Names.txt", OpenMode.Input)
i = 1
Do
   PlayerName(i) = LineInput(1)
   i = i + 1
Loop Until EOF(1)
FileClose(1)
```

Alternative:

```
Dim PlayerName(8) As String
Dim i As Integer
FileOpen(1, "Names.txt", OpenMode.Input)
For i = 1 To 8
   PlayerName(i) = LineInput(1)
Next
FileClose(1)
```

Alternative:

```
Dim sr As StreamReader = New StreamReader("Names.txt")
Dim line As String
line = sr.ReadLine()
i = 1
Do While (line <> Nothing)
   PlayerName(i) = line
   i = i + 1
   line = sr.ReadLine()
Loop
sr.Close()
```

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Q5 (b) (ii): Pascal

```
Var Names : TextFile;
   i : Integer;
   PlayerName : Array[1..8] Of String;
Begin
   AssignFile(Names, 'Names.txt');
   Reset(Names);
   i := 1;
   While Not Eof(Names) Do
   Begin
      Readln(Names, PlayerName[i]);
      Writeln(PlayerName[i]);
      i := i + 1;
   End;
   Close(Names);
   Readln;
End.
```

Alternative:

```
Var Names : TextFile;
   i : Integer;
   PlayerName : Array[1..8] Of String;
Begin
   AssignFile(Names, 'Names.txt');
   Reset(Names);
   For i := 1 To 8 Do
   Begin
      Readln(Names, PlayerName[i]);
      Writeln(PlayerName[i]);
   End;
   Close(Names);
   Readln;
End.
```

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Q5 (b) (ii): Python

```
# PlayerName : List
# NextPlayer : String
# File : File handle
File = open("Names.txt", "r")
PlayerName = []
while (1) :
   NextPlayer = File.readline()
   if not NextPlayer :
      break
   else :
      PlayerName.append(NextPlayer)
File.close()
```

Alternative:

```
# PlayerName : List
# NextPlayer : String
# File : File handle
# i : Integer
File = open("Names.txt", "r")
PlayerName = []
for i in range(1, 9) :
   NextPlayer = File.readline()
   PlayerName.append(NextPlayer)
File.close()
```

Alternative:

```
# PlayerName : List
# NextPlayer : String
# File : File handle
# i : Integer
File = open("Names.txt", "r")
PlayerName = ["" for i in range(8)]
for i in range(1, 9) :
   PlayerName[i - 1] = File.readline()
File.close()
```

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Q5 (b) (iii): Visual Basic

```
Found = False
i = 1

Do
   If ThisPlayerName = PlayerName(i) Then
      Found = True
      PlayerNumber = i
   Else
      i = i + 1
   End If
Loop Until Found = True Or i = 9
```

Q5 (b) (iii): Pascal

```
Begin
Found := False;
   i := 1;
   Repeat
      If (ThisPlayerName = PlayerName[i]) Then
      Begin
         Found := True;
         PlayerNumber := i;
      End
      Else
         i := i + 1;
   Until (Found) Or (i = 9);
End.
```

Q5 (b) (iii): Python

```
Found = FALSE
PlayerName = [j.strip() for j in PlayerName]
if ThisPlayerName in PlayerName :
   PlayerNumber = PlayerName.index(ThisPlayerName) + 1
   Found = TRUE
```

Alternative:

```
Found = False
i = 1
while not Found and i < 9 :
   if ThisPlayerName == PlayerName[i].strip() :
      Found = True
      PlayerNumber = i
   else :
      i = i + 1
```

Alternative:

```
Found = False
for i in range(1, 9) :
   if ThisPlayerName == PlayerName[i].strip() :
      Found = True
      PlayerNumber = i
```

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