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**COMPUTER SCIENCE**

**9608/22**

Paper 2 Written Paper

**October/November 2016**

MARK SCHEME

Maximum Mark: 75

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**Published**

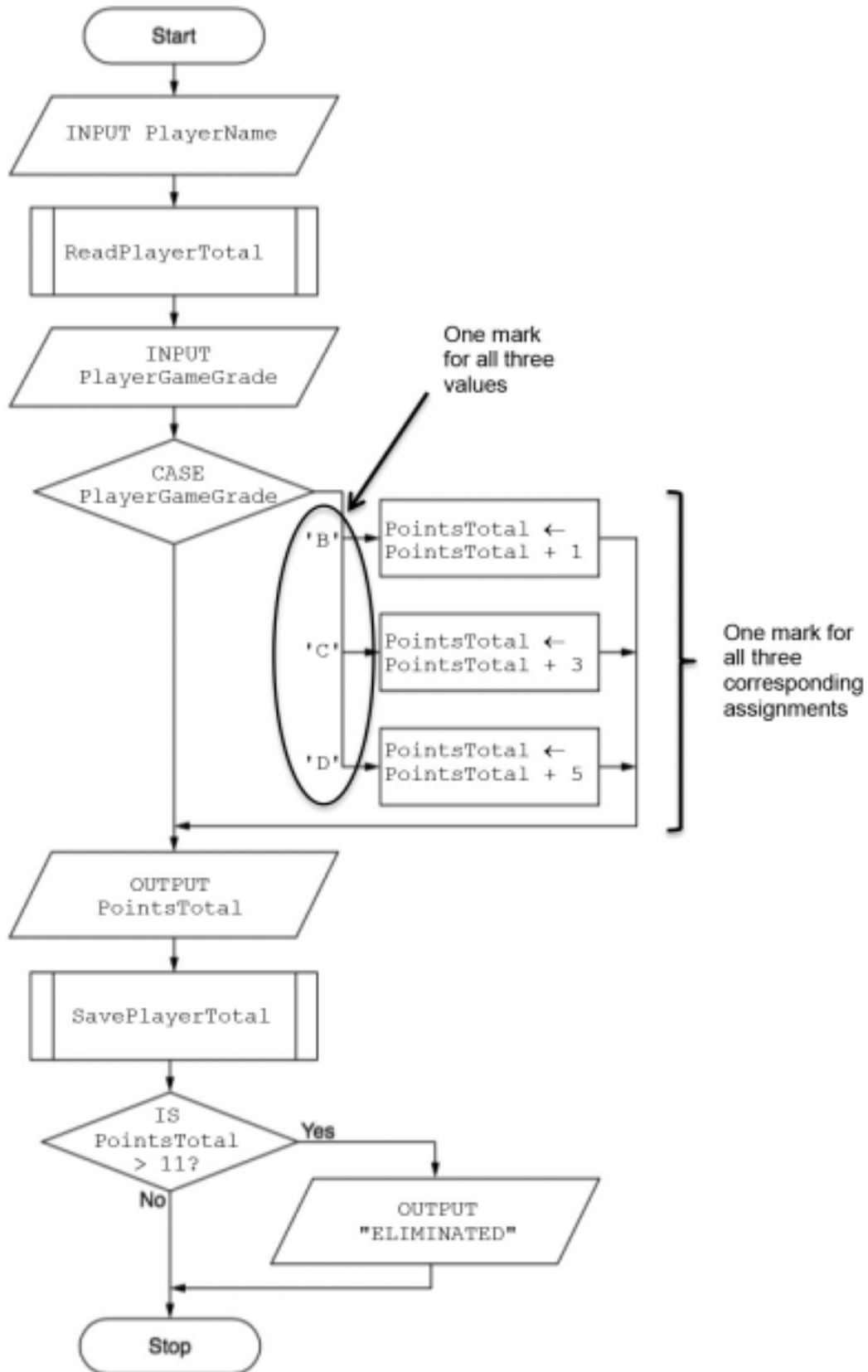
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1 (a)



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]

(c) NextChar <> '\*'

[1]

(d) (i)

i	j	NextChar	NextNumberString	Numbers		
				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]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	22

- 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]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	22

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) in a loop
- 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]

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	22

(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]

- (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]



Page 9	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	22

- 6 (i) 10 / 10.0 [1]
- (ii) 18.4 [1]
- (iii) 41 [1]
- (iv) TRUE [1]
- (v) 12.4 [1]

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Page 10	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	22

### 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.

```

<b>Page 11</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge International AS/A Level – October/November 2016</b>	<b>9608</b>	<b>22</b>

#### **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)
```

<b>Page 12</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge International AS/A Level – October/November 2016</b>	<b>9608</b>	<b>22</b>

**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()
```

<b>Page 13</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge International AS/A Level – October/November 2016</b>	<b>9608</b>	<b>22</b>

**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.
```

<b>Page 14</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge International AS/A Level – October/November 2016</b>	<b>9608</b>	<b>22</b>

**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()
```

<b>Page 15</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge International AS/A Level – October/November 2016</b>	<b>9608</b>	<b>22</b>

### 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

```