
COMPUTER SCIENCE

9608/21

Paper 2 Written Paper

October/November 2016

MARK SCHEME

Maximum Mark: 75

Published

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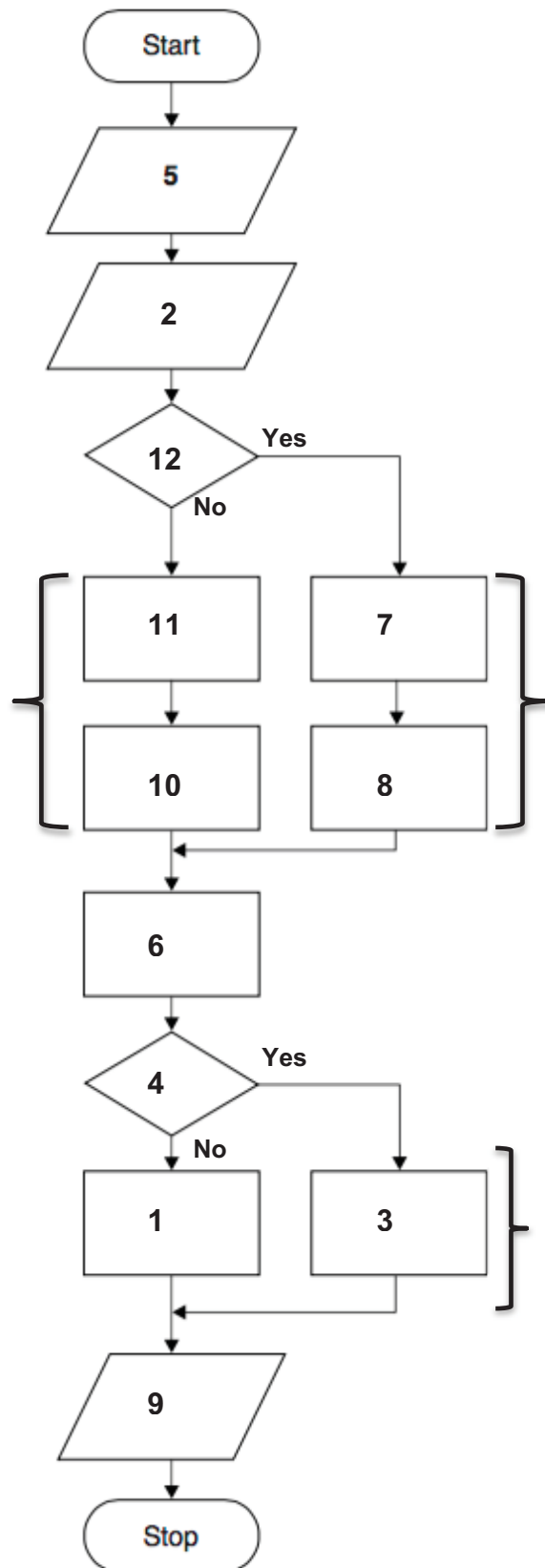
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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

1 (a)



Note: Order of 11, 10
and 7,8 may be
reversed.

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

One mark for each of the following symbols / symbol combinations:

- 2
- 7 and 8 from YES
- 10 and 11
- 6
- 1 and 3 (1 from NO, 3 from YES)
- 9
- 12 and 4

Max [6]

(b) Rows 2 to 7 are examples only

TicketType	BaggageWeight	Explanation	Expected output
E	15	Under the allowance	0
E	> 16	Under the allowance	<i>Charge</i>
S	<= 20	Under the allowance	0
S	> 20	Under the allowance	<i>Charge</i>
E	16	Boundary weight for a type E ticket	0
S	20	Boundary weight for a type S ticket	0
E or S	negative or non-numeric	Invalid weight	Error message

Ticket type	Baggage allowance (kg)	Charge rate per additional kg (\$)
'E'	16	3.50
'S'	20	5.75

One mark for each different test (examples above)

Max [5]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

(c) `INPUT TicketType`
`WHILE NOT (TicketType = 'E') OR (TicketType = 'S')`
`INPUT TicketType`
`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)

Status2	ReadingCount	ThisBit	BitCount	OUTPUT
			0	
1	1	1	1	
	2	0	1	
	3	1	2	
	4	1	3	
	5	1	4	
	6	0	4	
1				
	1	1	5	Error – Investigate
			0	
	2	1	1	
	3	0	1	
	4	0	1	
	5	1	2	
	6	1	3	
0				

1 must 'follow' 6 as shown by arrow. Can have only 1 or nothing above.

1

0 must 'follow' 6 as shown by arrow. Can have only 1 or nothing above.

0

One mark per area outlined

[7]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

(b) One mark for each of:

- Assignment: 01 // 02 // 06 // 09 // 14 // 18
- Selection: 07 // 11
- Iteration: 03 // 05

[3]

3 (a) (i) 7

[1]

(ii) 103

[1]

(iii) 'K'

[1]

(iv) "come"

[1]

(b) (i) PROCEDURE CalculateCustomerID

OUTPUT "Key in surname"

INPUT Surname

Length ← **CHARACTERCOUNT (Surname)**

CustomerID ← 0

FOR i ← 1 TO Length

//NextChar is a single character from Surname

Nextchar ← 1 **SUBSTR(Surname, i, 1)** // **ONECHAR(Surname, i)**

NextCodeNumber ← ASC (NextChar)

CustomerID ← CustomerID + **NextCodeNumber**

ENDFOR

OUTPUT "Customer ID is ", CustomerID

ENDPROCEDURE

One mark per phrase in **bold**

[3]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

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

```

PROCEDURE CalculateCustomerID
  DECLARE Surname : STRING
  DECLARE NextChar : CHAR
  DECLARE NextCodeNumber, i, CustomerID, SLength : INTEGER
  OUTPUT "Key in surname"
  INPUT Surname
  SLength ← LEN(Surname)
  CustomerID ← 0
  FOR i ← 1 TO SLength
    //NextChar is a single character from Surname
    Nextchar ← MID(Surname, i, 1)
    NextCodeNumber ← ASC(NextChar)
    CustomerID ← CustomerID + NextCodeNumber
  ENDFOR
  OUTPUT "Customer ID is ", CustomerID
ENDPROCEDURE

```

Mark as follows:

- Declaration of Surname as STRING and NextChar as CHAR and any three INTEGERS
- Prompt and Input
- Calculation of string length
- FOR Loop to process all characters in the string
- Assignment to NextChar in a loop
- Assignment to NextCodeNumber in a loop
- Totalling CustomerID in a loop
- Output following a loop

[6]

- (c) (i) Visual Basic

Function CalculateCustomerID(ByVal AnyName AS STRING) As Integer

Pascal

FUNCTION CalculateCustomerID(AnyName : STRING) : INTEGER

Python

def CalculateCustomerID(AnyName):

Mark as follows:

- Correct keyword + Function name
- Single input parameter of correct type
- Return parameter type

[3]

- (ii) Visual Basic

Return customerID // CalculateCustomerID = CustomerID

Pascal

Result := CustomerID // CalculateCustomerID := CustomerID

Python

Return CustomerID

[1]

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

(iii) Visual Basic

ThisID = CalculateCustomerID ("Wilkes")

Pascal

ThisID := CalculateCustomerID ('Wilkes')

Python

ThisID = CalculateCustomerID ("Wilkes")

One mark per underlined element

[3]

- (d) (i) • Built-in functions are made available by the programming language / already in the system
 • Built-in functions are ready made and tested
 • User-defined functions can be modified // built-in cannot be modified
 • User defined functions can be designed to meet the user's requirements
 • User-defined functions can only be used in that program / module [Max 2]

- (ii) • They have an identifier name
 • They return a value
 • They have none, one or more arguments
 • Both perform a specific task
 • Both represent re-usable code
 • Both are 'called' [Max 2]

- 4 (a) • Create / modify the source code using the text editor
 • Compiler translates the source code
 • Compiler produces the object code [Max 3]

- (b) (i) • Errors in keywords are highlighted // before the compilation process
 • Provides line-by-line syntax checking as code is typed in
 • Provides line number of the error
 • Display of known identifier names
 • Auto-complete
 • Colour-coding
 • Auto-indent
 • type checking
 • Subroutine parameter checking [Max 1]

- (ii) • Set break-points
 • Single step / step into/over subroutine
 • Window to watch the changing value of variables [Max 1]

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

(c) (i) OPEN "PRODUCTS" FOR READ

i ← 1

WHILE NOT EOF("PRODUCTS")

 READFILE ("PRODUCTS", PCode[i])

 READFILE ("PRODUCTS", PDescription[i])

 READFILE ("PRODUCTS", Temp // PRetailPrice[i])

 PRetailPrice[i] ← TONUM(Temp)

 i ← i + 1

ENDWHILE

CLOSE "PRODUCTS"

OUTPUT "Product file contents written to arrays"

One mark per bold phrase (three READFILE() counts as a single mark)

[5]

(ii) Benefit:

- The number of file read operations is reduced (by 2/3rds)
- It may use less storage / space in the file if strings are NOT fixed length
- All the data related to a single product is read at once / in one file operation / grouped together

Drawback:

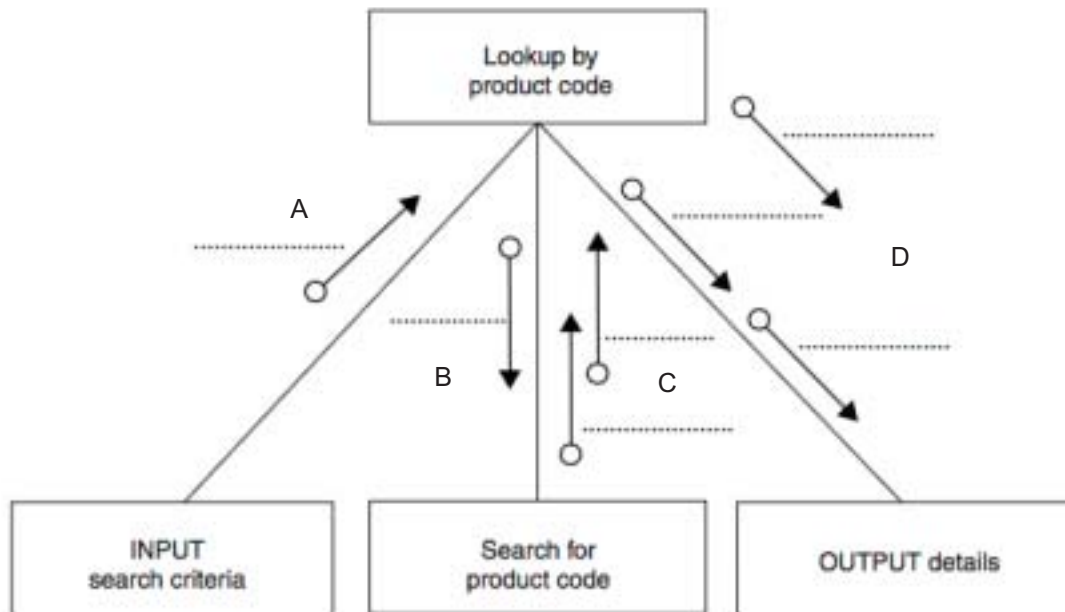
- The program will need to use the string handling functions to isolate each of the three items of data
- Difficult to isolate data items if the format is not consistent
- More difficult to search

Max one benefit and one drawback

[2]

Page 9	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

(d)



One mark per group (one or more names) as follows:

- A: SearchCode
- B: SearchCode // ThisIndex
- C: ThisRetailPrice, ThisDescription
- D: SearchCode, ThisDescription, ThisRetailPrice

[4]

Page 10	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

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

```

FUNCTION ProductCodeSearch(AnyName : String) RETURNS : Integer
  DECLARE FoundPos : Integer
  DECLARE i : Integer

  i ← 1
  FoundPos ← -1

  REPEAT
    IF AnyName = PCode[i]
      THEN
        FoundPos ← i
      ELSE
        i ← i + 1
      ENDIF
  UNTIL (i = 1001) OR (FoundPos <> -1)

  RETURN FoundPos

ENDFUNCTION

```

Mark as follows:

- Function header returns INTEGER
- Initialisation of index variable
- Loop through array PCode (including exit when found)
- Comparison of AnyName with PCode[i] in a loop
- Increment index variable in a loop
- Return index if AnyName found AND return -1 if AnyName not found

[Max 6]

- | | | |
|----------|---------------|-----|
| 5 | (i) 13 / 13.0 | [1] |
| | (ii) 18.6 | [1] |
| | (iii) TRUE | [1] |
| | (iv) 32 | [1] |
| | (v) 22 | [1] |

*** End of Mark Scheme – Example program code solutions follow ***

Page 11	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

Appendix – Example program code solutions

3(b)(ii): Visual Basic

```

Dim Surname As String
Dim NextChar As Char
Dim NextCodeNumber As Integer
Dim i As Integer
Dim CustomerID As Integer
Dim SLength As Integer

Console.Write("Key in surname ")
Surname = Console.ReadLine
SLength = Len(Surname)
CustomerID = 0
For i = 1 To SLength
    \\ NextChar is a single character from surname
    NextChar = Mid(Surname, i, 1)
    NextCodeNumber = Asc(NextChar)
    CustomerID = CustomerID + NextCodeNumber
Next

Console.WriteLine("Customer ID is " & CustomerID)

```

3(b)(ii): Pascal

```

Var Surname : string;
    SLength, i, CustomerID, NextCodeNumber : integer;
    NextChar : char;
begin
    Writeln ('Enter the surname: ');
    Readln (Surname);
    SLength := Length(Surname);
    CustomerID := 0;
    For i := 1 to SLength do
        begin
            NextChar := SurName[i];
            NextCodeNumber := Ord(NextChar);
            CustomerID := CustomerID + NextCodeNumber;
        end;
    Writeln ('Customer ID is ', CustomerID);
    Readln;
end.

```

Page 12	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

3(b)(ii): Python

```
# Surname String
# NextChar Char
# NextCodeNumber, I, CustomerID, SLength Integer

Surname = input("Key in Surname ")
SLength = len(Surname)
CustomerID = 0

for i in range(SLength):
    # NextChar is a single character from surname
    NextChar = Surname[i]
    NextCodeNumber = ord(NextChar)
    CustomerID = CustomerID + NextCodeNumber

print("Customer ID is " + str(CustomerID))
```

4(e): Visual Basic

```
Function ProductCodeSearch(ByVal SearchCode As String) As Integer
    Dim FoundCode As Integer
    Dim i As Integer

    i = 1
    FoundCode = -1

    Do
        If SearchCode = PCode(i) Then
            FoundCode = i
        Else
            i = i + 1
        End If
    Loop Until i = 1001 Or FoundCode <> -1
    Return FoundCode
End Function
```

Page 13	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9608	21

4(e): Pascal

```

Function ProductCodeSearch (SearchCode : String): integer;

    var FoundCode, ThisIndex : integer;
        Found : Boolean;

Begin
    Found := false;
    ThisIndex := 1;
    Repeat
        If SearchCode = PCode[ThisIndex] then
            Begin
                FoundCode := ThisIndex;
                Found := true;
            End
            Else
                ThisIndex := ThisIndex + 1;
        end;
    Until (ThisIndex = 1001) OR (Found);
    If Found = false then
        FoundCode := -1
    ProductCodeSearch := FoundCode;
end.

```

4(e): Python

```

def ProductCodeSearch(SearchCode):
    # list indexes start at zero
    i = 0
    Found = "no"
    while not(i == 1001 or Found == "yes"):
        if SearchCode == PCode[i]:
            Found = "yes"
            FoundIndex = i
        else:
            i = i + 1

    if Found == "no":
        FoundIndex = -1

    return FoundIndex

```