

QUESTION 8.



- 5 (a) • 1D Array // List
- INTEGER

[1]

[1]

(b) (i)

x	DayNumber	OUTPUT
0	1	
	2	
1	3	5/6/2015
	4	
2	5	7/6/2015
	6	
3	7	9/6/2015
		3

Note: 'x' and 'output' entries must be on or below the relevant 'DayNumber' entry
Mark as above

[4]



- (ii) • ... Sales for the first seven days
 • ... the number of days on which the total sales were 10 or over (1)
 • Outputs the corresponding dates (1)
 • Output the final value/total (of x) (1) [1]

(c) (i) 2 [1]

(ii)

Tick Cross	Explanation (if invalid)
X // ✓	2 nd parameter should be CHAR // accept just tick
X	Three parameters/should be 2 parameters
✓	

[3]

(d) OPENFILE "DISCOUNT_DATES" FOR **WRITE / WRITING** (1)
 INPUT **NextDate** (1)
 WHILE NextDate <> "XXX"
 INPUT Discount
NextLine = CONCAT(NextDate, " ", Discount) (1)
 WRITEFILE "DISCOUNT_DATES", NextLine
ENDWHILE (1)
 OUTPUT "File now created"
 CLOSEFILE

[4]

(e) (i) Sensible Identifier + Data Type + Description (1 + 1 + 1)

For example:

ThisDate	STRING/DATE	date 'entered by user'
Found	BOOLEAN	flag to indicate ThisDate is 'present in the file'
NextLine	STRING	a single line 'from the text file'
NextDate	STRING/DATE	date 'from next line in the file'
NextDiscount	STRING	the discount value from NextLine
ThisMonth	INTEGER	the month part of the date (input or from file)
MyStreamReader	STREAMREADER	references DISCOUNT_DATES file

Reject 'generic' reserved words

Allow **one** instance variable to store output string(s)

Allow **one** instance of month/day/year number e.g. ThisMonth shown above

[3]



(ii) Mark as follows:

Open file statement	(1)
File read statement for line text – <code>NextLine</code>	(1)
File close statement	(1)

Input of the required date – <code>ThisDate</code>	(1)
--	-----

Isolate <code>NextDate</code> from <code>NextLine</code>	(1)
--	-----

Isolate <code>NextDiscount</code> from <code>NextLine</code>	(1)
--	-----

IF statement comparing the two dates	(1)
--------------------------------------	-----

Uses Boolean variable <code>Found</code> to flag when found	(1)
---	-----

Post/pre condition loop iterate through the file	(1)
--	-----

Test for <u>EOF</u> or ' <u>found</u> '	(1)
---	-----

Note: These must follow some correct logic to score ...

Output 'No discount on this date' and Output 'This is a discount date')	(1)
--	-----

Output (when date not found) 'Date not found'	(1)
---	-----

Accept 'any' identifier names	[max 7]
-------------------------------	---------

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APPENDIX Programming Solutions

Question 1 (b) (ii)

Visual Basic ...

```

Dim RaceHours As Integer
Dim RaceMinutes As Integer
Dim RaceSeconds As Integer
Dim RaceTimeInSeconds As Integer
Dim PersonalBest As Integer

Console.Write("Time in hours ... ") : RaceHours = Console.ReadLine
Console.Write("Time in minutes... ") : RaceMinutes = Console.ReadLine
Console.Write("Time in seconds ... ")
RaceSeconds = Console.ReadLine
Console.Write("Personal best in seconds ... ")
PersonalBest = Console.ReadLine
RaceTimeInSeconds = RaceHours*60*60 + RaceMinutes*60 + RaceSeconds
Console.WriteLine(RaceTimeInSeconds)
If RaceTimeInSeconds < PersonalBest Then
    Console.WriteLine("New personal best time")
Else
    If RaceTimeInSeconds = PersonalBest Then
        Console.WriteLine("Equals personal best time")
    Else
        Console.WriteLine("Below personal best")
    End If
End If

```

Python ...

```

# RaceHours          - Integer
# RaceMinutes        - Integer
# RaceSeconds        - Integer
# RaceTimeInSeconds  - Integer
# PersonalBest       - Integer

RaceHours = int(input("Time in hours ... "))
RaceMinutes = int(input("Time in minutes... "))
RaceSeconds = int(input("Time in seconds ... "))
PersonalBest = int(input("Personal best in seconds ... "))

RaceTimeInSeconds = RaceHours*60*60 + RaceMinutes*60 + RaceSeconds

if RaceTimeInSeconds < PersonalBest:
    print("New personal best time")
elif RaceTimeInSeconds == PersonalBest:
    print("Equals personal best time")
else:
    print("Below personal best")

```


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Programming Solutions
Question 1 (b) (ii) – contd.

Pascal ...

```

var RaceHours      : Integer ;
var RaceMinutes    : Integer ;
var RaceSeconds    : Integer ;
var RaceTimeInSeconds : Integer ;
var PersonalBestTime : Integer ;

begin
  Writeln('Time in hours ... ') ; readln(RaceHours) ;
  Writeln('Time in minutes... ') ; readln(RaceMinutes) ;
  Writeln('Time in seconds ... ') ;
  readln(RaceSeconds) ;
  Writeln('Personal best in seconds ... ') ;

  Readln(PersonalBest) ;
  RaceTimeInSeconds := RaceHours*60*60 + RaceMinutes*60 + RaceSeconds ;
  Writeln(RaceTimeInSeconds) ;

  If RaceTimeInSeconds < PersonalBestTime Then
    Writeln('New personal best time')
  Else
    If RaceTimeInSeconds = PersonalBest Then
      Writeln('Equals personal best time')
    Else
      Writeln('Personal best time is unchanged) ;

Readln;
End

```

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Programming Solutions

Question 2 (d)

Visual Basic ...

```

Dim Choice As Integer
Dim NoOfAttempts As Integer
CONST i = 3
Do
    Call DisplayMenu()
    NoOfAttempts = 0
    Do
        Console.Write("Enter choice (1..4) ")
        Choice = Console.ReadLine
        NoOfAttempts = NoOfAttempts + 1
        Loop Until (Choice >= 1 And Choice <= 4) Or NoOfAttempts = i

        If Choice = 1 Then Call ReadFile()
        If Choice = 2 Then Console.WriteLine("Add customer code")
        If Choice = 3 Then Console.WriteLine("Search customer code")
    Loop Until Choice = 4

Sub DisplayMenu()
    Console.WriteLine()
    Console.WriteLine("1. Read customer file")
    Console.WriteLine("2. Add customer")
    Console.WriteLine("3. Search for a customer")
    Console.WriteLine("4. End")
    Console.WriteLine()
End Sub

Sub ReadFile()
    Console.WriteLine("Read file code")
End Sub

```

Python ...

```

def DisplayMenu():
    print()
    print("1. Read customer file")
    print("2. Add customer")
    print("3. Search for a customer")
    print("4. End")
    print()

def ReadFile():
    print("Read file code")

if __name__ == "__main__" :
    # Choice - Integer
    # NoOfAttempts - Integer

    Choice = 0
    while Choice !=4:
        DisplayMenu()

```



```
Choice = int(input"Enter choice (1..4) :")
NoOfAttempts = 1
while (Choice < 1 or Choice >4) and NoOfAttempts < 3:
    Choice = int(input"Enter choice (1..4) :")
    NoOfAttempts = 1
if Choice == 1:
    ReadFile()
elif Choice == 2:
    print("Add customer code")
elif Choice == 3:
    print("Print customer code")
```

Programming Solutions

Question 2 (d) – contd.

Pascal ...

```
var Choice          : Integer ;
var NoOfAttempts    : Integer ;
const i = 3 ;

procedure DisplayMenu ;
begin
    WriteLn();
    WriteLn('1. Read customer file') ;
    WriteLn('2. Add customer') ;
    WriteLn('3. Search for a customer');
    WriteLn('4. End') ;
    WriteLn() ;
End ;

Procedure ReadFile ;
begin
    WriteLn('Read file code');
End ;

begin

repeat
    DisplayMenu() ;
    NoOfAttempts := 0 ;
    repeat
        Writeln('Enter choice (1..4)') ; ReadLn(Choice) ;
        NoOfAttempts := NoOfAttempts + 1 ;
    Until ((Choice >= 1) And (Choice <= 4)) Or (NoOfAttempts = i);

    If Choice = 1 Then ReadFile() ;
    If Choice = 2 Then writeLn('Add customer code');
    If Choice = 3 Then WriteLn('Search customer code') ;
Until Choice = 4 ;

end.
```

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Programming Solutions

Question 5 (ii)

Visual Basic ...

```

Dim ThisDate As String : Dim NextDate As String
Dim FileString As String
Dim Found As Boolean

FileOpen(1, "D:DISCOUNT_DATES.txt", OpenMode.Input)
    or equivalent for a 'StreamReader' solutions

Console.Write("Date to find (DD/MM/YYYY)..")
ThisDate = Console.ReadLine
Found = False
Do
    FileString = LineInput(1)
    NextDate = Left(FileString, 10)
    If NextDate = ThisDate Then
        Found = True
        ' length is 15 when shows TRUE
    If Len(FileString) = 15 Then
        Console.WriteLine("This is a discount date")
    Else
        Console.WriteLine("No discount on this date")
    End If
    End If
Loop Until Found = True Or EOF(1)

FileClose(1)

If Found = False Then
    Console.WriteLine("Date not found")
End If

```

Python ...

```

MyFile = open("c:\DISCOUNT_DATES.txt", "r")
ThisDate = input("Next date ...(XXX to end)")

Found = 0
while Found == 0:
    NextLine = MyFile.readline()
    if not NextLine:
        break

    FileDate = NextLine[0:10]
    DiscountIndicator = NextLine[11:]

    if FileDate == ThisDate:
        Found = 1
        print (ThisDate, DiscountIndicator)

MyFile.close()
if Found == 0:

```

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```
print ("This date was not found")
```

Note: Found could be Boolean to give:

```
Found = False
while not Found:
```

Programming Solutions

Question 5 (ii) – contd.

Pascal ...

```
var ThisDate    : String ;
var NextDate    : String ;
var TheFile     : Text   ;
var FileString  : String ;
var Found       : Boolean ;

begin
assign(TheFile, 'k:\DISCOUNT_DATES.txt') ;
reset(TheFile) ;

writeln('Date to find (DD/MM/YYYY)..') ;
readln(ThisDate) ;
Found := False ;

repeat
  readln(TheFile, FileString) ;
  NextDate := copy(FileString,1, 10) ;

  If NextDate = ThisDate then
    begin
      Found := True ;
      { length is 15 when shows TRUE }
      if length(FileString) = 15 then
        writeln('This is a discount date')
      else
        writeln('No discount on this date')
      end ;
    end

until Found = True or EOF(TheFile) ;

close(TheFile) ;

if Found = False then writeln('Date not found') ;
```

QUESTION 9.



- 5 (a) (i) • Set of data items have a common name (1 mark)
• Items are referenced using a subscript/index (1 mark)
• Accept: all data items are of the same data type (1 mark) [max 2]
- (ii) 24 [1]
- (iii) • The total number of amplifiers 'produced' by workers 1, 2 and 3/three workers (1 mark)
• on day 2_ (1 mark) [2]



(b)

WorkerNum	DayNum	WorkerAverage	OUTPUT
1			
2			
3			
1	1		
	2		
	3		
	4		
2	1		
	2		
	3		
	4		
3	1		
	2		
	3		
	4		
1		2.25	
2		2	
3		1.25	INVESTIGATE 3

Worker

1	2
0	
	0
	0
10	
21	
31	
45	
	20
	36
	60
	80
	9
	20
	33
	50

[8]

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- (c) (i) WorkerNum : INTEGER (1 mark)
DayNum : INTEGER (1 mark)
WorkerTotal : ARRAY OF INTEGER
(1 mark) (1 mark)
WorkerAverage : REAL (1 mark) [ma

(ii) PROCEDURE AnalyseProductionData (NumDays : INTEGER, NumWorkers :
INTEGER)

FOR WorkerNum ← 1 TO 3
WorkerTotal [WorkerNum] ← 0
ENDFOR

FOR WorkerNum ← 1 TO 3
FOR DayNum ← 1 TO 4
WorkerTotal [WorkerNum] ← WorkerTotal [WorkerNum] +
ProductionData [WorkerNum, DayNum]

ENDFOR
ENDFOR

FOR WorkerNum ← 1 TO 3
WorkerAverage = WorkerTotal [WorkerNum] / (4)*
DailyHoursWorked [WorkerNum]
IF WorkerAverage < 2
THEN
OUTPUT "Investigate" WorkerNum
ENDIF
ENDFOR

ENDPROCEDURE

Mark as follows:

All '3's changed to NumWorkers

All '4's changed to NumDays

WorkerAverage '4' changed to NumDays [3]

(iii) (CALL) AnalyseProductionData (7, 13) [1]

QUESTION 10.



5 (a) (i)

N	i	j	Temp	1	2	3	4	5
				11	16	13	7	8
5								
	1	1						
		2			13	16		
		3				7	16	
		4					8	16
		5						
	2	1						
		2			7	13		
		3				8	13	
		4						
	3	1		7	11			
		2			8	11		
		3						
	4	1		<i>final values are:</i>				
		2		7	8	11	13	16

Terminates at 5 and 4 respectively

Must be:

- Preceded by other entries ...
- nothing after the 1, 2 sequence

Note these final values will not be shown on the same row ...

[8]

(ii) To sort / to order/put in ascending order the items (in the array) [1]

(iii) There were no swaps on the last pass / on pass 4 [1]

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(b)

Identifier	Data Type	Description
Num		
N	INTEGER	The number of numbers in the list
i	INTEGER	Loop counter // The number of 'passes' up through the list
j	INTEGER	The <u>index</u> // position in the array
Temp	INTEGER	Description must imply/states the 'swapping' operation

Mark as follows:

INTEGER × 4

One mark per description

[1]
[41]

QUESTION 11.



6 (a)	<table><tr><th>n</th><th>f</th><th>x</th><th>y</th><th>MID(String1, x, 1)</th><th>MID(String2, y, 1)</th></tr><tr><td>0</td><td>0</td><td></td><td></td><td></td></tr><tr><td>1</td><td></td><td>1</td><td>1</td><td>'R'</td><td>'R'</td></tr><tr><td></td><td></td><td>2</td><td>2</td><td>'E'</td><td>'A'</td></tr><tr><td>2</td><td></td><td>2</td><td>1</td><td>'E'</td><td>'R'</td></tr><tr><td>3</td><td></td><td>3</td><td>1</td><td>'T'</td><td>'R'</td></tr><tr><td>4</td><td></td><td>4</td><td>1</td><td>'R'</td><td>'R'</td></tr><tr><td></td><td></td><td>5</td><td>2</td><td>'A'</td><td>'A'</td></tr><tr><td></td><td></td><td>6</td><td>3</td><td>'C'</td><td>'C'</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	n	f	x	y	MID(String1, x, 1)	MID(String2, y, 1)	0	0				1		1	1	'R'	'R'			2	2	'E'	'A'	2		2	1	'E'	'R'	3		3	1	'T'	'R'	4		4	1	'R'	'R'			5	2	'A'	'A'			6	3	'C'	'C'						
	n	f	x	y	MID(String1, x, 1)	MID(String2, y, 1)																																																						
	0	0																																																										
	1		1	1	'R'	'R'																																																						
			2	2	'E'	'A'																																																						
	2		2	1	'E'	'R'																																																						
	3		3	1	'T'	'R'																																																						
	4		4	1	'R'	'R'																																																						
			5	2	'A'	'A'																																																						
			6	3	'C'	'C'																																																						
One mark per correct column																																																												
- Minus one mark if anything else on first row - Column 2 – '4' must not precede '4' in column 1 (as shown by arrow) - Letters must all be in upper case - Ignore quotation symbol																																																												
(b) (i)	- to search for a string within another string / String2 within String1 - to return the position of the start of String2 within String1 // by example First mark point: allow locate / find / calculate position of				2																																																							
(ii)	Value: 0 / zero Meaning: String2 not found in String1				2																																																							
(iii)	Option 1 - It is possible to “fall off” the end of String1 (or by example) while string match (for example, String1 = "Retrace", String2 = "Raced") - MID (String1, x, 1) // description of 'subscript out of range' Option 2 - If either string is empty then - subscript out of range error // description Option 3 - If String1 found within String 2 - An endless loop will occur				2																																																							



Appendix - Program Code Solutions

3 (b)(ii): VB.NET

```

Console.Write("Enter start position: ")
StartPos = Console.ReadLine()
Console.Write("Enter number to change: ")
NumToChange = Console.ReadLine()
For n = 0 To NumToChange - 1
    Console.Write("Enter new value for position: ")
    NewChar = Console.ReadLine()
    Lookup(StartPos + n) = NewChar
Next
Console.WriteLine(NumToChange & " entries changed")

```

ALTERNATIVE:

```

Console.Write("Enter start position: ")
StartPos = Console.ReadLine()
Console.Write("Enter number to change: ")
NumToChange = Console.ReadLine()
n = 0
Do
    Console.Write("Enter new value for position: ")
    NewChar = Console.ReadLine()
    Lookup(StartPos + n) = NewChar
    n = n + 1
Loop Until n = NumToChange
Console.WriteLine(NumToChange & " entries changed")

```

3 (b)(ii): Pascal

```

write('Enter start position: ');
readln(StartPos);
write('Enter number to change: ');
readln(NumToChange);
for n := 0 to NumToChange - 1 do
begin
    write('Input new value for position: ');
    readln(NewChar);
    LookUp[Startpos + n] := NewChar;
end;
writeln(IntToStr(NumToChange) + ' entries changed');

```



ALTERNATIVE:

```

write('Enter start position: ');
readln(StartPos);
write('Enter number to change: ');
readln(NumToChange);
n := 0;
repeat
    write('Input new value for position: ');
    readln(NewChar);
    LookUp[Startpos + n] := NewChar;
    n := n + 1;
until (n = NumToChange);
writeln(IntToStr(NumToChange) + ' entries changed');
```

3 (b)(ii): Python

```

StartPos = int(input("Enter start position: "))
NumToChange = int(input("Enter number to change: "))
for n in range(NumToChange) :
    NewChar = input("Input new value for position: ")
    LookUp[StartPos + n - 1] = NewChar
print(str(NumToChange) + " entries changed")
```

ALTERNATIVE:

```

StartPos = int(input("Enter start position: "))
NumToChange = int(input("Enter number to change: "))
n = 0
while n < NumToChange :
    NewChar = input("Input new value for position: ")
    LookUp[StartPos + n] = NewChar
    n = n + 1
print(str(NumToChange) + " entries changed")
```

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5 (b): VB.NET

A StreamWriter() solution:

```

Sub InputData()
    Dim CDTitle, CDArtist, CDLocation As String
    Dim FileHandle As IO.StreamWriter
    FileHandle = New IO.StreamWriter("MyMusic.txt") ("MyMusic.txt")
    Console.WriteLine("Input CD Title: ")
    CDTitle = Console.ReadLine()
    Do Until CDTitle = "##"
        Console.WriteLine("Input CD Artist: ")
        CDArtist = Console.ReadLine()
        Console.WriteLine("Input CD Location: ")
        CDLocation = Console.ReadLine()
        FileHandle.WriteLine(CDTitle & ":" & CDArtist & ":" & CDLocation)
        Console.WriteLine("Input CD Title: ")
        CDTitle = Console.ReadLine()
    Loop
    FileHandle.Close()
End Sub

```

A legacy FileOpen() solution:

```

Sub InputData()
    Dim CDTitle, CDArtist, CDLocation As String
    FileOpen(1, "MyMusic", OpenMode.Output)
    Console.WriteLine("Input CD Title: ")
    CDTitle = Console.ReadLine()
    Do Until CDTitle = "##"
        Console.WriteLine("Input CD Artist: ")
        CDArtist = Console.ReadLine()
        Console.WriteLine("Input CD Location: ")
        CDLocation = Console.ReadLine()
        Print(1, CDTitle & ":" & CDArtist & ":" & CDLocation)
        Console.WriteLine("Input CD Title: ")
        CDTitle = Console.ReadLine()
    Loop
    FileClose(1)
End Sub

```



5 (b): Pascal

```

procedure InputData;
var
    CDTitle, CDArtist, CDLocation : string;
    CDFile : Textfile;
begin
    assign(CDFile, 'MyMusic');
    rewrite(CDFile);
    writeln('Input CD Title: ');
    readln(CDTitle);
    while (CDTitle <> '##') do
    begin
        writeln('Input CD Artist: ');
        readln(CDArtist);
        writeln('Input CD Location: ');
        readln(CDLocation);
        writeln(CDFile, CDTitle + ':' + CDArtist + ':' + CDLocation);
        writeln('Input CD Title: ');
        readln(CDTitle);
    end;
    close(CDFile);
end;

```

5 (b): Python

```

def InputData() :
    #CDTitle String (or CDTitle = "")
    #CDArtist String (or CDArtist = "")
    #CDLocation String (or CDLocation = "")

    FileHandle = open("MyMusic", "w")
    CDTitle = input("Input CD Title: ")
    while CDTitle != "##" :
        CDArtist = input("Input CD Artist: ")
        CDLocation = input("Input CD location: ")
        FileHandle.write(CDTitle + ":" + CDArtist + ":" + CDLocation)
        CDTitle = input("Input CD Title: ")
    FileHandle.close()

```

QUESTION 12.



6 (a)	<table><tr><th>n</th><th>f</th><th>x</th><th>y</th><th>MID(String1, x, 1)</th><th>MID(String2, y, 1)</th></tr><tr><td>0</td><td>0</td><td></td><td></td><td></td></tr><tr><td>1</td><td></td><td>1</td><td>1</td><td>'R'</td><td>'R'</td></tr><tr><td></td><td></td><td>2</td><td>2</td><td>'E'</td><td>'A'</td></tr><tr><td>2</td><td></td><td>2</td><td>1</td><td>'E'</td><td>'R'</td></tr><tr><td>3</td><td></td><td>3</td><td>1</td><td>'T'</td><td>'R'</td></tr><tr><td>4</td><td></td><td>4</td><td>1</td><td>'R'</td><td>'R'</td></tr><tr><td></td><td></td><td>5</td><td>2</td><td>'A'</td><td>'A'</td></tr><tr><td></td><td></td><td>6</td><td>3</td><td>'C'</td><td>'C'</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> 	n	f	x	y	MID(String1, x, 1)	MID(String2, y, 1)	0	0				1		1	1	'R'	'R'			2	2	'E'	'A'	2		2	1	'E'	'R'	3		3	1	'T'	'R'	4		4	1	'R'	'R'			5	2	'A'	'A'			6	3	'C'	'C'							One mark per correct column - Minus one mark if anything else on first row - Column 2 – '4' must not precede '4' in column 1 (as shown by arrow) - Letters must all be in upper case - Ignore quotation symbol
	n	f	x	y	MID(String1, x, 1)	MID(String2, y, 1)																																																							
	0	0																																																											
	1		1	1	'R'	'R'																																																							
			2	2	'E'	'A'																																																							
	2		2	1	'E'	'R'																																																							
	3		3	1	'T'	'R'																																																							
	4		4	1	'R'	'R'																																																							
			5	2	'A'	'A'																																																							
			6	3	'C'	'C'																																																							
(b) (i)	- to search for a string within another string / String2 within String1 - to return the position of the start of String2 within String1 // by example First mark point: allow locate / find / calculate position of	2																																																											
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Appendix - Program Code Solutions

3 (b)(ii): VB.NET

```

Console.Write("Enter start position: ")
StartPos = Console.ReadLine()
Console.Write("Enter number to change: ")
NumToChange = Console.ReadLine()
For n = 0 To NumToChange - 1
    Console.Write("Enter new value for position: ")
    NewChar = Console.ReadLine()
    Lookup(StartPos + n) = NewChar
Next
Console.WriteLine(NumToChange & " entries changed")

```

ALTERNATIVE:

```

Console.Write("Enter start position: ")
StartPos = Console.ReadLine()
Console.Write("Enter number to change: ")
NumToChange = Console.ReadLine()
n = 0
Do
    Console.Write("Enter new value for position: ")
    NewChar = Console.ReadLine()
    Lookup(StartPos + n) = NewChar
    n = n + 1
Loop Until n = NumToChange
Console.WriteLine(NumToChange & " entries changed")

```

3 (b)(ii): Pascal

```

write('Enter start position: ');
readln(StartPos);
write('Enter number to change: ');
readln(NumToChange);
for n := 0 to NumToChange - 1 do
begin
    write('Input new value for position: ');
    readln(NewChar);
    LookUp[Startpos + n] := NewChar;
end;
writeln(IntToStr(NumToChange) + ' entries changed');

```

Page 12	Mark Scheme	
	Cambridge International AS/A Level – May/June 2016	



ALTERNATIVE:

```

write('Enter start position: ');
readln(StartPos);
write('Enter number to change: ');
readln(NumToChange);
n := 0;
repeat
    write('Input new value for position: ');
    readln(NewChar);
    LookUp[Startpos + n] := NewChar;
    n := n + 1;
until (n = NumToChange);
writeln(IntToStr(NumToChange) + ' entries changed');
```

3 (b)(ii): Python

```

StartPos = int(input("Enter start position: "))
NumToChange = int(input("Enter number to change: "))
for n in range(NumToChange) :
    NewChar = input("Input new value for position: ")
    LookUp[StartPos + n - 1] = NewChar
print(str(NumToChange) + " entries changed")
```

ALTERNATIVE:

```

StartPos = int(input("Enter start position: "))
NumToChange = int(input("Enter number to change: "))
n = 0
while n < NumToChange :
    NewChar = input("Input new value for position: ")
    LookUp[StartPos + n] = NewChar
    n = n + 1
print(str(NumToChange) + " entries changed")
```



5 (b): VB.NET

A StreamWriter() solution:

```
Sub InputData()
    Dim CDTitle, CDArtist, CDLocation As String
    Dim FileHandle As IO.StreamWriter
    FileHandle = New IO.StreamWriter("MyMusic.txt") ("MyMusic.txt")
    Console.WriteLine("Input CD Title: ")
    CDTitle = Console.ReadLine()
    Do Until CDTitle = "##"
        Console.WriteLine("Input CD Artist: ")
        CDArtist = Console.ReadLine()
        Console.WriteLine("Input CD Location: ")
        CDLocation = Console.ReadLine()
        FileHandle.WriteLine(CDTitle & ":" & CDArtist & ":" & CDLocation)
        Console.WriteLine("Input CD Title: ")
        CDTitle = Console.ReadLine()
    Loop
    FileHandle.Close()
End Sub
```

A legacy FileOpen() solution:

```
Sub InputData()
    Dim CDTitle, CDArtist, CDLocation As String
    FileOpen(1, "MyMusic", OpenMode.Output)
    Console.WriteLine("Input CD Title: ")
    CDTitle = Console.ReadLine()
    Do Until CDTitle = "##"
        Console.WriteLine("Input CD Artist: ")
        CDArtist = Console.ReadLine()
        Console.WriteLine("Input CD Location: ")
        CDLocation = Console.ReadLine()
        Print(1, CDTitle & ":" & CDArtist & ":" & CDLocation)
        Console.WriteLine("Input CD Title: ")
        CDTitle = Console.ReadLine()
    Loop
    FileClose(1)
End Sub
```



5 (b): Pascal

```

procedure InputData;
var
    CDTitle, CDArtist, CDLocation : string;
    CDFile : Textfile;
begin
    assign(CDFile, 'MyMusic');
    rewrite(CDFile);
    writeln('Input CD Title: ');
    readln(CDTitle);
    while (CDTitle <> '##') do
    begin
        writeln('Input CD Artist: ');
        readln(CDArtist);
        writeln('Input CD Location: ');
        readln(CDLocation);
        writeln(CDFile, CDTitle + ':' + CDArtist + ':' + CDLocation);
        writeln('Input CD Title: ');
        readln(CDTitle);
    end;
    close(CDFile);
end;

```

5 (b): Python

```

def InputData() :
    #CDTitle String (or CDTitle = "")
    #CDArtist String (or CDArtist = "")
    #CDLocation String (or CDLocation = "")

    FileHandle = open("MyMusic", "w")
    CDTitle = input("Input CD Title: ")
    while CDTitle != "##" :
        CDArtist = input("Input CD Artist: ")
        CDLocation = input("Input CD location: ")
        FileHandle.write(CDTitle + ":" + CDArtist + ":" + CDLocation)
        CDTitle = input("Input CD Title: ")
    FileHandle.close()

```

QUESTION 13.



6 (a) (i)

n	x	Flag	m	NewString
–		TRUE	7	“”
1	‘B’	FALSE		“B”
2	‘i’			“Bi”
3	‘g’			“Big”
4	‘▽’	TRUE		“Big▽”
5	‘B’	FALSE		“Big▽B”
6	‘e’			“Big▽Be”
7	‘n’			“Big▽Ben”

One mark per correct column (**columns 3 and 4 count as 1**)

- Arrows indicate required sequence (i.e. “B” can’t be in row before TRUE)
- Letter case must be as shown
- Ignore quotation symbol
- Allow “ ” or ▽ for space symbol

(ii) (To return a string where:)

[2]

- The first character of each word is capitalised / made upper case // by explanation
- The remaining characters (of each word) are made lower case

(b) (i) • The function operates normally // returns an ‘empty string’

[1]

(ii) Examples of suitable test strings:

[3]

- Strings with all capitals
- Strings with all lower case
- Strings with first letters of words already capitalised (i.e. in correct format)
- Strings in “reverse” format – i.e. first letters lower case, the rest upper case
- String with only one word
- Strings with multiple spaces
- Strings with numbers / symbols

One mark for each string example **plus** supporting explanation.



Appendix – Program Code Example Solutions

Q3 (b): VB.NET

```

Console.WriteLine("Enter start position")
StartIndex = Console.ReadLine()
Console.WriteLine("Enter how many")
NumberToOutput = Console.ReadLine()
For Index = StartIndex To StartIndex + NumberToOutput - 1
    OriginalChar = Chr(Index)
    CipherChar = Lookup(Index)
    Console.WriteLine("Index " & Index & ": Character " & OriginalChar &
        " has substitute character " & CipherChar)
Next Index

```

Q3 (b): Pascal

```

Writeln('Enter start position');
Readln(StartIndex);
Writeln('Enter how many');
Readln(NumberToOutput);
For index := StartIndex To StartIndex + NumberToOutput - 1 Do
Begin
    OriginalChar := chr(index);
    CipherChar := Lookup[index];
    writeln("Index " + index + ": Character " + OriginalChar +
        " has substitute character " & CipherChar);
end;

```

Q3 (b): Python

```

startIndex = int(input("enter start position"))
numberToOutput = int(input("enter how many"))
for index in range(startIndex, (startIndex + numberToOutput)) :
    OriginalChar = chr(index)
    CipherChar = Lookup[index]
    print("Index " + (index) + ": Character " + OriginalChar +
        " has subst char " + CipherChar)

```



Q5 (b): VB.NET

A StreamReader() solution:

```
Sub OutPutLocationList()

    Dim Total As Integer
    Dim FileData As String
    Dim ObjReader As IO.StreamReader
    ObjReader = New IO.StreamReader("C:\MyMusic.txt")
    Dim CDLocation As String
    Dim CDTitle As String
    Dim CDArtist As String

    Total = 0
    Console.WriteLine("Input location to search ")
    CDSearch = Console.ReadLine
    Do While ObjReader.Peek <> -1
        FileData = ObjReader.ReadLine()
        If Right(FileData, 8) = CDLocation Then
            CDTitle = Left(FileData, 40)
            CDArtist = Mid(FileData, 41, 40)
            Console.WriteLine(CDTitle & " " & CDArtist)
            Total = Total + 1
        End If
    Loop
    Console.WriteLine(Total & " CDs were found")
    ObjReader.Close()
End Sub
```

A legacy FileOpen() solution:

```
Sub OutPutLocationList()

    Dim Total As Integer
    Dim FileData As String
    FileOpen (1, "C:\MyMusic.txt", OpenMode.Input)
    Dim CDLocation As String
    Dim CDTitle As String
    Dim CDArtist As String

    Total = 0
    Console.WriteLine("Input location to search ")
    CDSearch = Console.ReadLine
    Do While NOT EOF(1)
        Input(1, FileData)
        If Right(FileData, 8) = CDSearch Then
            CDTitle = Left(FileData, 40)
            CDArtist = Mid(FileData, 41, 40)
            Console.WriteLine(CDTitle & " " & CDArtist)
            Total = Total + 1
        End If
    Loop
    Console.WriteLine(Total & " CDs were found")
    FileClose(1)
End Sub
```



Q5 (b): Pascal

```

procedure OutputLocationList;
var
    FileData, CDLocation, CDTitle, CDArtist : String;
    CDFile : Textfile;
    Total : Integer;
Begin
    Total := 0;
    Writeln('Input location to search ');
    Readln(CDSearch);
    AssignFile(CDFile, 'MyMusic.txt');
    Reset(CDFile);

    While not eof(CDFile) Do
    Begin
        readln(CDFile, FileData);
        If copy(FileData, 80, 8) = CDSearch Then
        Begin
            CDTitle := copy(FileData, 1, 40);
            CDArtist := copy(FileData, 41, 40);
            Writeln(CDTitle + ' : ' + CDArtist);
            Total := Total + 1;
        End;
    End;

    Writeln(Total + ' CDs were found');
    CloseFile(CDFile);

End

```

Q5 (b): Python

```

#total : Integer
#CDSearch, LineOfText, LineString : String

Def OutPutLocationList():
    FileHandle = open("MyMusicPy.TXT", "r")
    total = 0
    CDSearch = input("Enter location to search")
    LineOfText = FileHandle.readline()
    while len(LineOfText) > 0:
        LineString = LineOfText[80:87]    #extract last 8 characters
        (location)
        if LineString == CDSearch:
            total = total+1
            CDTitle = LineOfText[0:39]    #extract CD title
            CDArtist = LineOfText[40:79]  #extract CD artist
            print(CDTitle + ": " + CDArtist)
            LineOfText = FileHandle.readline() #read next line
        print("There are " + str(total) + " in that location")
    FileHandle.close()

```


QUESTION 14.



- | | | | | |
|----------|------------|--------------|----------------|-----|
| 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 <> '*'

(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]

QUESTION 15.

Cambridge
International
AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level



COMPUTER SCIENCE

9608/21

Paper 2 Written Paper

October/November 2017

MARK SCHEME

Maximum Mark: 75

Published

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Cambridge Assessment
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Question	Answer															
1(a)(i)	<table><tr><th>Data value</th><th>Data type</th></tr><tr><td>27</td><td>INTEGER</td></tr><tr><td>"27"</td><td>STRING</td></tr><tr><td>"27.3"</td><td>STRING</td></tr><tr><td>TRUE</td><td>BOOLEAN</td></tr><tr><td>27/3/2015</td><td>DATE // DATETIME</td></tr><tr><td>27.3</td><td>REAL</td></tr></table> One mark for each data type Mark first data type given in each case	Data value	Data type	27	INTEGER	"27"	STRING	"27.3"	STRING	TRUE	BOOLEAN	27/3/2015	DATE // DATETIME	27.3	REAL	
Data value	Data type															
27	INTEGER															
"27"	STRING															
"27.3"	STRING															
TRUE	BOOLEAN															
27/3/2015	DATE // DATETIME															
27.3	REAL															
1(a)(ii)	1D Array // 1DList	2														
1(a)(iii)	- Each character is represented by an <u>unique</u> / <u>corresponding</u> - binary code / integer / value	2														
1(b)	- When a section of code would be repeated - When a piece of code is needed to perform a specific task - To support modular programming / step wise refinement - Easier to debug / maintain - Built-in / library routines are tried and tested One mark per answer	Max 2														
1(c)	<pre>CASE OF MyVar 1: CALL Proc1() 2: CALL Proc2() 3: CALL Proc3() OTHERWISE OUTPUT "Error" ENDCASE</pre> One mark for: - First line and ENDCASE - All clauses for 1, 2 and 3 'OTHERWISE' clause - OUTPUT statement	4														



Question	Answer
1(d)	Ability to recognise: • selection statement • iteration statement • assignment statements • data declarations / structures / data types / use of variables or objects • modular structure / functions / procedures / subroutines • subroutine parameters • Specific types of statement, e.g. Input, Output, File operations • Code format • Operators Mark as follows: Any two from above, or valid alternative Accept by example

Question	Answer	Marks																																										
2(a)	<table><tr><th>StartNumber</th><th>EndNumber</th><th>Divisor</th><th>NumberFound</th><th>Number</th><th>Remainder</th><th>Output</th></tr><tr><td>11</td><td>13</td><td>2</td><td>0</td><td>11</td><td>1</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td>12</td><td>0</td><td>12</td></tr><tr><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td>13</td><td>1</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Count: 1</td></tr></table> One mark for correct Number column One mark for correct Remainder column One mark for correct Output	StartNumber	EndNumber	Divisor	NumberFound	Number	Remainder	Output	11	13	2	0	11	1						12	0	12				1								13	1								Count: 1	3
StartNumber	EndNumber	Divisor	NumberFound	Number	Remainder	Output																																						
11	13	2	0	11	1																																							
				12	0	12																																						
			1																																									
				13	1																																							
						Count: 1																																						
2(b)	Mark as follows: - For a (given) range of values - Counts the number of times one number (numerator) is an exact divisor of the other - Outputs each numerator (only) - Outputs the count Accept by example No mark for: ...calculate the remainder ...add one to NumberFound	3																																										



Question	Answer
2(c)	<pre> graph TD Start([START]) --> Input[/INPUT StartNumber, EndNumber, Divisor/] Input --> Init1[NumberFound ← 0] Init1 --> Init2[Number ← StartNumber] Init2 --> LoopStart(()) LoopStart --> Mod[Remainder ← MODULUS(Number, Divisor)] Mod --> Div{Remainder = 0?} Div -- YES --> Out1[/OUTPUT Number/] Out1 --> IncFound[Increment NumberFound] IncFound --> LoopStart Div -- NO --> LoopStart LoopStart --> EndCheck{Number = EndNumber?} EndCheck -- YES --> Out2[/OUTPUT "Count: " & NumberFound/] Out2 --> Stop([STOP]) EndCheck -- NO --> IncNum[Increment Number] IncNum --> LoopStart </pre> The flowchart describes a process to count the number of integers between StartNumber and EndNumber (inclusive) that are divisible by Divisor. It begins with a START terminal, followed by an input block for StartNumber, EndNumber, and Divisor. Two initialization steps are shown: NumberFound ← 0 and Number ← StartNumber, which are grouped by a bracket. The process then enters a loop. The first step in the loop is to calculate the remainder of Number divided by Divisor using the MODULUS function. A decision diamond checks if the remainder is 0. If YES, the current Number is output, and NumberFound is incremented. If NO, the process skips the output and increment steps. Both paths lead to a second decision diamond: Number = EndNumber?. If YES, the final count is output as "Count: " followed by NumberFound, and the process stops at the STOP terminal. If NO, the Number is incremented, and the loop repeats from the MODULUS calculation step.



Question	Answer
2(c)	Mark as follows: • One mark for <code>START</code> and <code>STOP / END</code> • One mark for bracketed pair • One mark for each of other labelled boxes (shape must be correct for decision box) Decision box outputs must have two outputs and at least one label (<code>Yes / No</code>) Different statement categories should not appear in the same symbol (e.g. assignment and I/O) No mark for symbol (or pair) if parent missing or logically incorrect (except for <code>START/END</code>) Full marks should be awarded for functionally equivalent solutions.



Question	Answer
3(a)	<pre> PROCEDURE BubbleSort DECLARE Temp : STRING DECLARE FirstID, SecondID : INTEGER DECLARE NoSwaps : BOOLEAN DECLARE Boundary : INTEGER Declare J : INTEGER Boundary ← 99 REPEAT NoSwaps ← TRUE FOR J ← 1 TO Boundary FirstID ← UserNameArray[J] SecondID ← UserNameArray[J + 1] IF FirstID > SecondID THEN Temp ← UserNameArray[J] UserNameArray[J] ← UserNameArray[J + 1] UserNameArray[J + 1] ← Temp NoSwaps ← FALSE ENDIF ENDFOR Boundary ← Boundary - 1 UNTIL NoSwaps = TRUE ENDPROCEDURE </pre> Mark as follows: 1. Procedure heading and ending (allow array as input parameter) 2. Variable declaration for counter / index (integer) or temp (string) 3. Outer working loop 4. Inner loop with suitable range 5. Correct comparison in a loop 6. Correct swap of complete array element in a loop 7. Set flag to indicate swap in inner loop and resetting in outer loop 8. Reducing Boundary in a loop



Question	Answer
3(b)	Pseudocode solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix. <pre> PROCEDURE FindRepeats DECLARE i, RepeatCount: INTEGER DECLARE FirstID, SecondID: STRING RepeatCount ← 0 FOR i ← 2 TO 100 FirstID ← LEFT(UsernameArray[i - 1], 6) SecondID ← LEFT(UsernameArray[i], 6) IF FirstID = SecondID THEN RepeatCount ← RepeatCount + 1 OUTPUT(UsernameArray[i]) ENDIF ENDFOR IF RepeatCount = 0 THEN OUTPUT "The array contains no repeated UserIDs" ELSE OUTPUT "There are " & RepeatCount & " repeated userIDs" ENDIF ENDPROCEDURE </pre> Mark as follows (all must be correct syntax for chosen language): 1. Procedure heading and ending 2. Variable declaration for INTEGER (comment in Python) and initialisation for RepeatCount (or equivalent name) 3. Loop 4. Extraction of UserID in a loop 5. Correct comparison of consecutive elements... in a loop 6. ...output correct array element (NOT original, only duplicates) in a loop 7. increment RepeatCount following a comparison in a loop 8. Correct conditional statement checking RepeatCount (or equivalent) and then two correct final OUTPUT statements



Question	Answer	
3(c)(i)	• Problem definition • Design • Coding / programming • Testing • Documentation • Implementation • Maintenance	
3(c)(ii)	<u>Integrated Development Environment</u> or a suitable description	1
3(c)(iii)	Examples include: • context sensitive prompts • (dynamic) syntax checking • use of colours to highlight key words / pretty printing • Formatting • Single-stepping • Breakpoints • Report / watch window • (UML) modelling • Compiler/interpreter • Text editor	Max 2
3(c)(iv)	Run-time	1

Question	Answer	Marks												
4(a)	<table><thead><tr><th>Value</th><th>Formatted String</th></tr></thead><tbody><tr><td>1327.5</td><td>"□ 1327.50"</td></tr><tr><td>1234</td><td>"□ 1234.00"</td></tr><tr><td>7.456</td><td>"□□□ 07.45"</td></tr></tbody></table> Leading spaces must be present	Value	Formatted String	1327.5	"□ 1327.50"	1234	"□ 1234.00"	7.456	"□□□ 07.45"	2				
Value	Formatted String													
1327.5	"□ 1327.50"													
1234	"□ 1234.00"													
7.456	"□□□ 07.45"													
4(b)	<table><thead><tr><th>Value</th><th>Required output</th><th>Mask</th></tr></thead><tbody><tr><td>1234.00</td><td>"1,234.00"</td><td>"0,000.00"</td></tr><tr><td>3445.66</td><td>"£3,445.66"</td><td>"£0,000.00"</td></tr><tr><td>10345.56</td><td>"\$□□10,345"</td><td>"\$##00,000"</td></tr></tbody></table> Currency and 'punctuation' symbols must be as shown	Value	Required output	Mask	1234.00	"1,234.00"	"0,000.00"	3445.66	"£3,445.66"	"£0,000.00"	10345.56	"\$□□10,345"	"\$##00,000"	3
Value	Required output	Mask												
1234.00	"1,234.00"	"0,000.00"												
3445.66	"£3,445.66"	"£0,000.00"												
10345.56	"\$□□10,345"	"\$##00,000"												



Question	Answer	
5(a)	<pre>PROCEDURE MakeNewfile DECLARE OldFileLine : STRING DECLARE NewFileLine : STRING OPENFILE "EmailDetails" FOR READ OPENFILE "NewEmailDetails" FOR WRITE WHILE NOT EOF("EmailDetails") READFILE "EmailDetails", OldFileLine NewFileLine ← "00" & OldFileLine WRITEFILE "NewEmailDetails", NewFileLine ENDWHILE CLOSEFILE "EmailDetails" CLOSEFILE "NewEmailDetails" ENDPROCEDURE</pre> Mark as follows: 1. Variable declaration of <code>STRING</code> for <code>OldFileLine</code> (or equivalent) 2. Open <code>EmailDetails</code> for <code>READ</code> 3. Open <code>NewEmailDetails</code> for <code>WRITE</code> 4. Correct loop checking for <code>EOF (EmailDetails)</code> 5. Reading a line from <code>EmailDetails</code> in a loop 6. Correct concatenation in a loop 7. Writing a line to <code>NewEmailDetails</code> in a loop Closing both files	
5(b)	Invalid string examples: A string with nothing before '@' A string with nothing after '@' A string with 1 or 2 characters after '@' A string with no '@' symbol A string with more than one '@' symbol Explanation Sensible explanation mapping each given string to an individual rule One mark for string One mark for explanation Each rule should be tested once only	6

**Programming Example Solutions****Q3(b): Visual Basic**

```
Sub FindRepeats()  
    Dim Repeats As Integer  
    Dim i As Integer  
    Dim FirstID As String  
    Dim SecondID As String  
  
    Repeats = 0  
    For i = 1 To 99  
        FirstID = Left(UsernameArray(i), 6)  
        SecondID = Left(UsernameArray(i + 1), 6)  
        If FirstID = SecondID Then  
            Console.WriteLine(UsernameArray(i + 1))  
            Repeats = Repeats + 1  
        End If  
    Next i  
  
    If Repeats = 0 Then  
        Console.WriteLine("The array contains no repeated UserIDs")  
    Else  
        Console.WriteLine("There are " & Repeats & " repeated UserIDs")  
    End If  
  
End Sub
```

Alternative:

```
Sub FindRepeats ()  
  
    Dim RepeatCount, i As Integer  
    Dim FirstID, SecondID As String  
  
    RepeatCount = 0  
    For i = 1 to 99  
        FirstID = Left(UsernameArray(i-1),6)  
        SecondID = Left(UsernameArray(i),6)  
        If FirstID = SecondID then  
            Console.WriteLine (UsernameArray(i))  
            RepeatCount = RepeatCount + 1  
        End If  
    Next i  
  
    If RepeatCount = 0 then  
        Console.WriteLine ("The array contains no repeated UserIDs")  
    Else  
        Console.WriteLine ("There are "& RepeatCount & " repeated UserIDs")  
    End If  
  
End Sub
```

**Q3(b): Pascal**

```
procedure FindRepeats ();  
  
var  
    RepeatCount, i : integer;  
    FirstID, SecondID : string;  
  
begin  
    RepeatCount := 0;  
    for i := 1 to 99 do  
        begin  
            FirstID := Copy(UsernameArray[i-1],1,6);  
            SecondID := Copy(UsernameArray[i],1,6);  
            if FirstID = SecondID then  
                begin  
                    writeln (UsernameArray[i]);  
                    RepeatCount := RepeatCount + 1;  
                end;  
            end;  
  
            if RepeatCount = 0 then  
                writeln ('The array contains no repeated UserIDs')  
            else  
                writeln ('There are ', RepeatCount, ' repeated UserIDs')  
            end;  
        end;  
    end;
```

**Q3(b): Python**

```
def FindRepeats():
    #Repeats, i Integer
    #FirstID, SecondID string
    Repeats = 0
    for i in range(0, len(UsernameArray)-1):
        FirstID = (UsernameArray[i])[:6]
        SecondID = (UsernameArray[i+1])[:6]
        if FirstID == SecondID:
            print(UsernameArray[i+1])
            Repeats = Repeats + 1
    if Repeats == 0:
        print("The array contains no repeated UserIDs")
    else:
        print("There are ", Repeats, " repeated UserIDs")
```

Alternative:

```
def FindRepeats ():

    RepeatCount = 0                                ## Defined as an integer

    for i in range (1,100):                        ## depending on next two
lines(0,99) (2,101)
        FirstID = UsernameArray[i-1]              ## Defined as string
        SecondID = UsernameArray[i]               ## Defined as string
        if FirstID[0:6] == SecondID[0:6]:         ## Using split
            print (UsernameArray[i])
            RepeatCount += 1

    if repeatCount == 0:
        print ('The array contains no repeated UserIDs')
    else:
        print ('There are ', RepeatCount, ' repeated UserIDs')
```

QUESTION 16.

Cambridge
International
AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level



COMPUTER SCIENCE

9608/21

Paper 1 Written Paper

October/November 2018

MARK SCHEME

Maximum Mark: 75

Published

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.

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Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **12** printed pages.



Cambridge Assessment
International Education



Generic Marking Principles

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- marks are not deducted for errors
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GENERIC MARKING PRINCIPLE 4:

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GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.



Question	Answer			
1(a)(i)	Statement	Selection	Repetition (Iteration)	Assignment
	WHILE Count < 20		✓	
	Count ← Count + 1			✓
	If MyGrade <> 'C' THEN	✓		
	Mark[Count] ← GetMark(StudentID)			✓
	ELSE OUTPUT "Fail"	✓		
	ENDFOR		✓	
	One mark for each row			
1(b)(i)	Statement		Data type	
	MyAverage ← 13.5		REAL	
	ProjectCompleted ← TRUE		BOOLEAN	
	Subject ← "Home Economics"		STRING	
	MyMark ← 270		INTEGER	
	MyGrade ← 'B'		CHAR	
1(b)(ii)	Expression		Evaluates to	
	"Air-" & MID(Subject, 7, 3)		"Air-con"	
	INT(MyAverage / 2)		6	
	ProjectCompleted AND MyMark > 270		FALSE	
	ProjectCompleted OR MyMark > 260		TRUE	
	ASC(MyGrade / 3)		ERROR	



Question	Answer	
2(a)	<pre> FUNCTION GetDiscountRate(CardNum : STRING) RETURNS REAL DECLARE DRate : REAL DECLARE Points : INTEGER DRate ← 0 Points ← GetPoints(CardNum) IF Points > 199 THEN DRate ← 0.2 ELSE IF Points > 99 THEN DRate ← 0.1 ENDIF ENDIF ENDIF IF Today() = 3 THEN DRate ← DRate * 1.2 ENDIF RETURN DRate ENDFUNCTION </pre> 1 mark for each of the following: 1 Correct FUNCTION heading (as given) and end 2 Declaring local variables for DRate and Points 3 Initialisation of DRate to zero and Points ← GetPoints(CardNum) 4 IF ... THEN ...(ELSE) ... ENDIF with Points > 199 5 (Nested) IF ... THEN ... ENDIF with Points > 99 6 ...correct assignments of DRate to 0.2 and 0.1 7 Checking Today() = 3 and increasing DRate by 20% 8 Return parameter // GetDiscountRate ← DRate Mark points 7 and 8 must not be nested	
2(b)(i)	Name: Syntax Description: Rules of programming language have not been followed Name: Logic Description: Where the program does not behave as expected / does not give the expected result / an error in the logic of the algorithm 1mark for name + 1 mark for corresponding description	2
2(b)(ii)	Name: Stub testing Description: A function could be written for GetPoints() that simply returns a test value or outputs a message (i.e. doesn't do the CardNum lookup)	2



Question	Answer	
2(c)(i)	1 mark for any of the following two values: 0.1 0.2 1.2 99 199 3	
2(c)(ii)	Example: CONSTANT MinDiscount = 0.1 1 mark for each of the following: • meaningful identifier name and corresponding value • correct syntax	2
2(c)(iii)	1 mark for: • The value cannot accidentally get changed // be different in two places • A change to the value requires changing in one place only / don't have to repeatedly write out the same value throughout the program	2
2(c)(iv)	Tried and tested // pre compiled (contains no syntax errors)	1
2(c)(v)	1 mark for feature (Name) and 1 mark for corresponding description (explanation) Example: Name: Meaningful variable names Explanation: To reduce the risk of referring to the wrong variable / make the code easier to understand Name: Indentation Explanation: To see where loops / selection start / end // indicate program structure Name: Variable type-checking as part of module interface Explanation: Reduces the risk of using an incorrect parameter Name: Pretty-Printing Explanation: Highlights the error / auto-complete / type checking Name: / <u>Dynamic</u> Syntax Checking Explanation: Highlights the error as code is typed in	2



Question	Answer																
3(a)	Code has to be in machine code (or equivalent) to be executed																
3(b)	1 mark for the name (what you do) and one for description (how) For example: Method: • Dry run the code // use of white box testing // trace tables • Trace the contents of variables // trace all possible routes through the program Method: • Breakpoints • Run the code to a set point to find error Method: • Variable watch • Check the contents of variables at specific points in the program Method: • Stepping • Execute the code line by line Method: • Include OUTPUT statements in the code • to display the value of variables as the code was running																
3(c)	<table border="1"> <thead> <tr> <th data-bbox="264 1149 986 1211">Statement</th><th data-bbox="986 1149 1166 1211">White-box</th><th data-bbox="1166 1149 1347 1211">Black-box</th></tr> </thead> <tbody> <tr> <td data-bbox="264 1211 986 1312">The student does not need to know the structure of the code.</td><td data-bbox="986 1211 1166 1312"></td><td data-bbox="1166 1211 1347 1312">✓</td></tr> <tr> <td data-bbox="264 1312 986 1413">The student chooses data to test every possible path through the code.</td><td data-bbox="986 1312 1166 1413">✓</td><td data-bbox="1166 1312 1347 1413"></td></tr> <tr> <td data-bbox="264 1413 986 1514">The student chooses normal, boundary and erroneous data.</td><td data-bbox="986 1413 1166 1514">✓</td><td data-bbox="1166 1413 1347 1514">(✓)</td></tr> <tr> <td data-bbox="264 1514 986 1608">The student chooses data to test that the program meets the specification.</td><td data-bbox="986 1514 1166 1608"></td><td data-bbox="1166 1514 1347 1608">✓</td></tr> </tbody> </table> 1 mark per row	Statement	White-box	Black-box	The student does not need to know the structure of the code.		✓	The student chooses data to test every possible path through the code.	✓		The student chooses normal, boundary and erroneous data.	✓	(✓)	The student chooses data to test that the program meets the specification.		✓	4
Statement	White-box	Black-box															
The student does not need to know the structure of the code.		✓															
The student chooses data to test every possible path through the code.	✓																
The student chooses normal, boundary and erroneous data.	✓	(✓)															
The student chooses data to test that the program meets the specification.		✓															



Question	Answer		
4(a)(i)	The identifier name of a global integer referenced	NumElements	
	The identifier name of a user-defined procedure	SaveToFile	
	The line number of an unnecessary statement	16	
	The scope of <code>ArrayString</code>	Local	
4(a)(ii)	1 mark for each mark point: - Loop / repeat / iterate through array <code>ResultArray</code> one element at a time - extract a string from <u>row / column 1</u> of the array - compare the string with <code>SearchString</code> - if they match, call <code>SaveToFile()</code> and increment <code>NumberFound</code>		4
4(b)	Pseudocode solution included here for development and clarification of mark scheme. Programming language solutions appear at the end of this mark scheme. <pre>FUNCTION ScanArray(SearchString : STRING) RETURNS INTEGER DECLARE ArrayIndex : INTEGER DECLARE ArrayString : STRING DECLARE NumberFound : INTEGER NumberFound ← 0 FOR ArrayIndex ← 1 TO NumElements ArrayString ← ResultArray[ArrayIndex, 1] IF TO_UPPER(ArrayString) = TO_UPPER(SearchString) THEN CALL SaveToFile(ArrayString) NumberFound ← NumberFound + 1 ENDIF ENDFOR RETURN NumberFound ENDFUNCTION</pre> 1 mark for each of the following: - Function header and end including parameter and return - Declaration of two local variables as above but NOT <code>NumElements</code> - FOR ... ENDFOR loop with range as given - Referencing each element from the array - Converting both strings to uppercase / lowercase - If strings are equal then Call <code>SaveToFile()</code> and increment <code>NumberFound</code>		6



Question	Answer	
4(c)	1 mark for name; 1 mark for each advantage (max 2) Name: Stepwise refinement // Top-down design // Modularisation // Decomposition Advantage: • Makes the problem / task / algorithm easier to understand // reduce program complexity • Smaller modules easier to develop / test / debug • Programmers can work on different modules // different expertise	
4(d)	Pseudocode solution included here for development and clarification of mark scheme. Programming language solutions appear at the end of this mark scheme. <pre> DECLARE ResultArray : ARRAY [1:100, 1:2] OF STRING DECLARE i, j : INTEGER FOR i ← 1 to 100 FOR j ← 1 to 2 ResultArray[i, j] ← '*' ENDFOR ENDFOR </pre> One mark for: • <code>ResultArray</code> declaration / commented in Python • assigning to all elements • assignment of <code>'*'</code>	3



Question	Answer
5	<pre> FUNCTION SaveStatus() RETURNS BOOLEAN DECLARE Time : STRING DECLARE Fuel : STRING DECLARE Distance : STRING DECLARE FileData : STRING DECLARE Tries : INTEGER DECLARE ReturnFlag : BOOLEAN Tries ← 1 ReturnFlag ← TRUE Distance ← GetDistance() Fuel ← GetFuel() Time ← GetTime() WHILE Time = NULL AND Tries < 3 Time ← GetTime() Tries ← Tries + 1 ENDWHILE IF Time = NULL THEN ReturnFlag ← FALSE ELSE FileData ← Time & ',' & Fuel & ',' & Distance OPENFILE "CarStatus.txt" FOR APPEND WRITEFILE "CarStatus.txt", FileData CLOSEFILE "CarStatus.txt" ENDIF RETURN ReturnFlag ENDFUNCTION </pre> 1 mark for each of the following: 1 Function heading as shown 2 Declare Time local variable as STRING 3 Calls GetDistance() and GetFuel() once 4 Loop (up to three times or) until Time <> NULL 5 Call GetTime() in a loop 6 Return FALSE if 3 NULLs 7 Open file in APPEND mode 8 Forming the text string with comma separators and write to the file 9 OPEN ... WRITE ... CLOSE as three lines not separated by loop 10 Return TRUE



Program Code Solutions

Q4 (b): Visual Basic

```
Function ScanArray(SearchString As String) As Integer

    Dim ArrayIndex As Integer
    Dim ArrayString As String
    Dim NumberFound As Integer

    NumberFound = 0

    For ArrayIndex = 1 To NumElements
        ArrayString = ResultArray(ArrayIndex, 1)
        If UCase(ArrayString) = UCase(SearchString) Then
            Call SaveToFile(ArrayString)
            NumberFound = NumberFound + 1
        End If
    Next ArrayIndex
    Return NumberFound

End Function
```

Q4 (b): Pascal

```
function ScanArray(SearchString : String) : Integer;

var
    ArrayIndex : Integer;
    ArrayString : String;
    NumberFound : Integer;

begin
    NumberFound := 0;

    For ArrayIndex := 1 To NumElements do
        begin
            ArrayString := ResultArray[ArrayIndex, 1];
            If ToUpper(ArrayString) = ToUpper(SearchString) then
                begin
                    SaveToFile(ArrayString); // Keyword "Call" not valid
                    NumberFound := NumberFound + 1;
                end;
            end;
        end;

    Result := NumberFound; // ScanArray := NumberFound
end.
```


**Q4 (b): Python**

```
def ScanArray(SearchString):  
  
    # ArrayIndex : integer  
    # ArrayString : string  
    # NumberFound : integer  
  
    NumberFound = 0  
  
    for ArrayIndex in range(NumElements): # 0 to NumElements-1  
        ArrayString = ResultArray[ArrayIndex][0]  
        if ArrayString.upper == SearchString.upper:  
            SaveToFile(ArrayString) # Keyword "Call" not valid  
            NumberFound = NumberFound + 1  
  
    return NumberFound # ScanArray := NumberFound
```

**Q4 (d): Visual Basic**

```
Dim ResultArray(100, 2) As String
Dim i, j As Integer

For i = 1 to 100
    For j = 1 to 2
        ResultArray(i, j) = '*'
    Next j
Next i
```

Q4 (d): Pascal

```
var
    ResultArray : array[1..100, 1..2] of string;
    i, j : integer;
begin
    For i := 1 to 100 do
        For j := 1 to 2 do
            begin
                ResultArray[i, j] := '*';
            end;
        end;
    end.
```

Q4 (d): Python

```
# ResultArray[1..100, 1..2] : String

ResultArray = [[''] * 2 for i in range(100)]

for i in range(100):
    for j in range(2):
        ResultArray[i][j] = ''
```

Q4 (d): Python – alternative 1 of n

```
# ResultArray[1..100, 1..2] : String

ResultArray = [['*'] * 2 for i in range(100)]
```

Q4 (d): Python – alternative 2 of n

```
# ResultArray[1..100, 1..2] : String

ResultArray = [['*'] * 2] * 100
```

QUESTION 17.



Question	Answer
2(a)(i)	<pre> FUNCTION CalcPoints(CardNum: STRING, Total: REAL) RETURNS INTEGER DECLARE OldPoints : INTEGER DECLARE NewPoints : INTEGER IF Total > 100 THEN OldPoints ← GetPoints(CardNum) IF OldPoints > 2000 THEN NewPoints ← INT(Total * 1.2) ELSE NewPoints ← INT(Total * 1.1) ENDIF ELSE NewPoints ← 0 ENDIF RETURN NewPoints ENDFUNCTION </pre> 1 mark for each of the following: 1 Correct FUNCTION heading (as given) and end 2 Declaring local variables for OldPoints and NewPoints 3 IF...THEN...ELSE...ENDIF with Total > 100 4 ...Newpoints set to zero if Total <= 100 5 Nested IF...THEN...ELSE...ENDIF with OldPoints > 2000 6 ... with correct assignments of NewPoints 7 Return NewPoints for all cases



Question	Answer	
2(a)(ii)	<pre> FUNCTION GetTotal() RETURNS REAL DECLARE Valid : BOOLEAN DECLARE Amount : REAL Valid ← FALSE REPEAT OUTPUT "Enter the amount" INPUT Amount IF Amount > 0 AND Amount < 10000 THEN Valid ← TRUE ENDIF UNTIL Valid = TRUE RETURN Amount ENDFUNCTION </pre> Note that the pseudocode shown is only an example. The use of an explicit flag and IF structure are not essential provided the functionality is provided. 1 mark for each of: 1 declaration of local variable(s) used 2 prompt followed by input 3 conditional loop 4 checking that input value > 0 and input value < 10000 5 returning the value	
2(b)(i)	1 mark for name, 1 mark for description Accept by example for description Name: Run-time Description: The program executes an illegal instruction // performs an illegal operation that is trapped by the OS	2
2(b)(ii)	One specific value from within each of the following ranges: For example: • 73 (a value ≤ 100) • 145.3 (a value > 100) 1 mark for the value, plus one for a meaningful description.	4

QUESTION 18.



Question	Answer
2(a)(i)	<pre>FUNCTION CalcBonus(CardNum: STRING) RETURNS INTEGER DECLARE Points : INTEGER DECLARE Bonus : INTEGER DECLARE Spend : REAL Points ← GetPoints(CardNum) Spend ← GetSpend(CardNum) IF Points > 2000 THEN Bonus ← 100 ELSE IF Spend > 1000 THEN Bonus ← 50 ELSE Bonus ← 10 ENDIF ENDIF ENDIF RETURN Bonus ENDFUNCTION</pre> 1 mark for each of the following up to max 5 marks: 1 Function heading (inc parameters) and ending 2 Declaring local variables and two function calls as above 3 IF...THEN...ELSE...ENDIF with Points > 2000 4 (Nested) IF...THEN...ELSE with Spend > 1000 5 ... assignment of Bonus to 10, 50 100 6 Return parameter



Question	Answer	
2(a)(ii)	The pseudocode shown here is only an example. The use of an explicit flag and IF structure are not essential provided the functionality is provided. <pre> FUNCTION GetCardNumber() RETURNS STRING DECLARE Valid : BOOLEAN DECLARE CardNum : STRING Valid ← FALSE REPEAT OUTPUT "Enter card number" INPUT CardNum IF LENGTH(CardNum) = 16 AND IS_NUM(CardNum) = TRUE THEN Valid ← TRUE ENDIF UNTIL Valid RETURN CardNum ENDFUNCTION </pre> 1 mark for each of the following: 1 Declaring local variable to store user input 2 Conditional Loop 3 Prompt and input of CardNum 4 Length check 5 Checking IS_NUM(CardNum) is TRUE 6 Return a value	
2(b)(i)	Name: Logic (error) Description: Where the program does not behave as expected / Does not give expected result / An error in the logic of the algorithm OR Name: Run-time // execution (error) Description: The program performs an illegal operation One mark for name + one mark for corresponding description	2
2(b)(ii)	Values: any Spend value and Points > 2000 Justification: Bonus should be 100 Values: Spend > 1000 and Points <= 2000 Justification: Bonus should be 50 Values: Spend <= 1000 and Points <= 2000 Justification: Bonus should be 10 2 marks for values 2 marks for relevant and appropriate reasons	4



Question	Answer
2(c)	Name: Corrective Reason: Amend the algorithm to 'eliminate errors' Name: Adaptive Reason: In response to specification change arising from changes to business rules or environment (regulatory) Name: Perfective Reason: To make improvements to the program One mark for each name plus one mark for corresponding reason up to max 4 marks





Question	Answer	
4(b)	<pre> DECLARE Code : ARRAY[1:500, 1:4] OF STRING DECLARE RowIndex : INTEGER DECLARE ColIndex : INTEGER FOR RowIndex ← 1 TO 500 FOR ColIndex ← 1 TO 4 Code[RowIndex, ColIndex] ← "Empty" ENDFOR ENDFOR </pre> One mark for each of the following: 1 Array declaration 2 Additional local variable 3 Nested loops 4 Array element assignment within the inner loop RowIndex and ColIndex can be interchangeable	
4(c)	Adaptive Maintenance	1

QUESTION 20.

Cambridge
International
AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level



COMPUTER SCIENCE

9608/22

Paper 2 Written Paper

May/June 2019

MARK SCHEME

Maximum Mark: 75

Published

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- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
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Question	Answer														
1(a)(i)	- a sequence of steps / stages / instructions - to implement a task // solution to a problem Allow alternatives to sequence providing meaning is clear.														
1(a)(ii)	Input: - e.g. <code>INPUT MyVar // READFILE MyFile, MyString</code> Process: - e.g. <code>NextChar ← 'X' // Count ← Count + 1</code> Output:: - e.g. <code>OUTPUT "Hello World" // WRITEFILE "LogFile.txt", SomeData</code> Mark as follows: One mark for each stage (Input and Process) One mark for each pseudocode example														
1(b)(i)	<table><thead><tr><th>Expression</th><th>Evaluates to</th></tr></thead><tbody><tr><td><code>STRING_TO_NUM(RIGHT(ID, 3))</code></td><td>234.0 / 234</td></tr><tr><td><code>INT(Height * Children)</code></td><td>11</td></tr><tr><td><code>IsMarried AND Married < 31/12/1999</code></td><td>TRUE</td></tr><tr><td><code>LENGTH(ID & NUM_TO_STRING(Height))</code></td><td>8</td></tr><tr><td><code>MID((ID, INT(Height) - Children, 2)</code></td><td>"23"</td></tr></tbody></table> No quotes for row 1 Quotes (single or double) for row 5	Expression	Evaluates to	<code>STRING_TO_NUM(RIGHT(ID, 3))</code>	234.0 / 234	<code>INT(Height * Children)</code>	11	<code>IsMarried AND Married < 31/12/1999</code>	TRUE	<code>LENGTH(ID & NUM_TO_STRING(Height))</code>	8	<code>MID((ID, INT(Height) - Children, 2)</code>	"23"		5
Expression	Evaluates to														
<code>STRING_TO_NUM(RIGHT(ID, 3))</code>	234.0 / 234														
<code>INT(Height * Children)</code>	11														
<code>IsMarried AND Married < 31/12/1999</code>	TRUE														
<code>LENGTH(ID & NUM_TO_STRING(Height))</code>	8														
<code>MID((ID, INT(Height) - Children, 2)</code>	"23"														
1(b)(ii)	<table><thead><tr><th>Variable</th><th>Data type</th></tr></thead><tbody><tr><td><code>Married</code></td><td>DATE</td></tr><tr><td><code>ID</code></td><td>STRING</td></tr><tr><td><code>MiddleInitial</code></td><td>CHAR</td></tr><tr><td><code>Height</code></td><td>REAL</td></tr><tr><td><code>IsMarried</code></td><td>BOOLEAN</td></tr></tbody></table> One mark per data type	Variable	Data type	<code>Married</code>	DATE	<code>ID</code>	STRING	<code>MiddleInitial</code>	CHAR	<code>Height</code>	REAL	<code>IsMarried</code>	BOOLEAN		5
Variable	Data type														
<code>Married</code>	DATE														
<code>ID</code>	STRING														
<code>MiddleInitial</code>	CHAR														
<code>Height</code>	REAL														
<code>IsMarried</code>	BOOLEAN														



Question	Answer	
2(a)(i)	- To make a more manageable / understandable solution - To support modular design	
2(a)(ii)	- Allows the subroutine to be called from many / multiple places - Subroutine may be (independently) tested and debugged - If the task changes the change needs to be made only once - Reduces unnecessary duplication / program lines - Allows teams to work on different parts of the solution	
2(a)(iii)	Type of subroutine: Function Justification: It returns a value // assigns a value to variable <i>Answer</i> One mark for type One mark for justification	2
2(b)	- An editor is used to produce / write / modify the <u>source code</u> / <u>program</u> / <u>high-level language code</u> OR by example: An editor provides (features such as) context-sensitive prompts / dynamic syntax checking etc. - A translator (compiler) is used to translate / convert the source code / program / high-level language code into <u>object code</u> / <u>machine code</u> / <u>an executable file</u>. OR A translator (interpreter) is used to translate the source code / program / high-level language code <u>line by line</u> - A debugger is used to test the program / detect errors (and correct errors) in the program. One mark per bullet point	3



Question	Answer
2(c)	Control structure: A (pre-) <u>conditional</u> loop Function of code: • Check if <code>Result</code> is less than 20 and If true, calls <code>ResetSensor</code> with parameter value 3... • ... and assign the value returned by <code>GetSensor</code> with parameter value 3 to <code>Result</code> • Loop until <code>Result >= 20</code> OR Control structure: A selection // conditional statement Function of code: • Check if <code>Result</code> is less than 20 and If true, calls <code>ResetSensor</code> with parameter value 3... • ... and assign the value returned by <code>GetSensor</code> with parameter value 3 to <code>Result</code> One mark for control structure, maximum two for function Function of code marks independent of answer to control structure

Question	Answer	Marks
3(a)(i)	<u>PROCEDURE SubA</u> (<u>A : STRING</u>, <u>B : INTEGER</u>, <u>BYREF C : CHAR</u>) One mark for each underlined part Ignore <code>BYVAL</code> for parameter A and/or parameter B Parameter order / names not important but must be correct data types	3
3(a)(ii)	<u>Function SubB</u> (<u>D : STRING</u>, <u>E : INTEGER</u>) <u>RETURNS BOOLEAN</u> One mark for each underlined part Ignore <code>BYVAL</code> for parameter D and/or parameter E Parameter order / names not important but must be correct data types	3
3(b)	• Selection • Iteration • Sequence One mark per bullet to max. 2	2



Question	Answer				
4(a)(i)	Index	NextChar	Selected	NewValue	NewString
			0		"0"
	1	'1'			"01"
	2	'2'			"012"
	3	'∇'		12	
			12		
					"0"
	4	'3'			"03"
	5	'4'			"034"
	6	'∇'		34	
			34		
					"0"
	7	'5'			"05"
	8	'∇'		5	
					"0"
	9	'∇'		0	
					"0"
	10	'3'			"03"
	11	'9'			"039"
One mark for each column. If no mark for columns, award one mark for initialisation of <i>Selected</i> to 0 and <i>Newstring</i> to '0' (single or double quotes).					
4(a)(ii)	34				
					1



Question	Answer	
4(b)(i)	- The final value (in the string) is the largest value (39) and is not considered // final comparison with variable <code>Selected</code> is not made - The loop terminates at the end of the string (the character 9) // there wasn't a final space / non-numeric digit One mark per bullet.	
4(b)(ii)	- Check the (final) value of <code>NewString</code> after the loop... ...and see if it is greater than <code>Selected</code> (repeat the existing conditional clause) OR - Amend the algorithm to add a space character / non-numeric character to the end of the string... ...before the <code>FOR</code> loop / at the start of the function One mark per bullet point Accept alternative workable solution	2



Question	Answer	
5(a)	One mark for each of: • Open the file • Set a count to zero • Loop until end of file // no more lines to read • Increment the count each time a line is read in a loop Maximum 3 marks	
5(b)	<pre>PROCEDURE CountLines(FileName : STRING) DECLARE NumLines : INTEGER DECLARE Dummy : STRING NumLines ← 0 OPENFILE FileName FOR READ WHILE NOT EOF(FileName) READFILE FileName, Dummy NumLines ← NumLines + 1 ENDWHILE CLOSEFILE FileName OUTPUT "Number of lines in the file : ", NumLines ENDPROCEDURE</pre> One mark for each of the following: 1. Procedure header and end, including parameter 2. Declaration and initialisation of a local INTEGER to count lines (e.g. NumLines) 3. OPEN file in read mode and CLOSE file 4. WHILE loop stopping when EOF(FileName) 5. Read a line from the file and increment NumLines in a loop 6. Output a message plus the NumLines outside a loop	6



Question	Answer
6(a)	'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix. <pre> FUNCTION GetInfo() RETURNS STRING DECLARE ID : STRING DECLARE PreferredName : STRING DECLARE Valid : BOOLEAN Valid ← FALSE WHILE Valid = FALSE OUTPUT "Please Enter a valid ID" INPUT ID IF LENGTH(ID) = 5 AND LEFT(ID, 1) >= 'A' <u> </u> AND LEFT(ID, 1) <= 'Z' <u> </u> AND ISNUM(RIGHT(ID, 4)) <u> </u> THEN Valid ← TRUE ENDIF ENDWHILE OUTPUT "Please enter preferred name" INPUT PreferredName RETURN ID & '*' & PreferredName ENDFUNCTION </pre> One mark for each of the following: 1. Function header and end (where appropriate) 2. Local variables used are declared (commented in python) 3. Prompt and input for ID (until valid) and preferred name 4. Conditional loop repeating while ID is invalid 5. test length in a loop 6. test first character in a loop 7. test last four characters in a loop 8. Concatenate using correct separator character and return resulting string



Question	Answer	
6(b)	'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix. <pre> PROCEDURE TopLevel() DECLARE Response : CHAR DECLARE InputData : STRING DECLARE Success : BOOLEAN Response ← 'Y' WHILE Response = 'Y' InputData ← GetInfo() IF LEFT(InputData,1) < 'N' THEN Success ← WriteInfo(InputData, "File1.txt") ELSE Success ← WriteInfo(InputData, "File2.txt") ENDIF IF NOT Success THEN Response ← 'N' ELSE OUTPUT "Enter details for another student? (Y/N)" INPUT Response ENDIF ENDWHILE ENDPROCEDURE </pre> One mark for each of the following: 1. Procedure header and end 2. Conditional loop terminated with user input 3. call to <code>GetInfo()</code> in a loop 4. check first character of returned <code>UserID</code> value in a loop 5. call(s) to <code>WriteInfo()</code> in both cases ... 6. ... with two <code>STRING</code> parameters in a loop 7. exit procedure if <code>WriteInfo()</code> unsuccessful in a loop 8. if <code>WriteInfo()</code> successful, prompt and check input to repeat / exit in a loop	
6(c)	<u>FUNCTION WriteInfo (FileData : STRING, Filename : STRING)</u> <u>RETURNS BOOLEAN</u> One mark per underlined section	3

**Program Code Example Solutions****Q6 (a): Visual Basic**

```
Function GetInfo() As String
    Dim ID As String = ""
    Dim PreferredName As String = ""
    Dim Valid As Boolean = False
    While Valid = False
        Console.WriteLine("Please enter a valid ID : ")
        ID = Console.ReadLine()
        If Len(ID) = 5 And Left(ID, 1) >= "A" And Left(ID, 1) <= "Z" And IsNumeric(Right(ID, 4)) Then
            Valid = True
        End If
    End While
    Console.WriteLine("Please enter preferred name : ")
    PreferredName = Console.ReadLine()
    Return ID & "*" & PreferredName
End Function
```

Alternative:

```
Function GetInfo() As String

    Dim ID As String
    Dim PreferredName As String
    Dim Valid As Boolean
    Dim Number As String
    Dim Size As Integer
    Dim i As Integer

    Valid = False

    While Valid = False
        Console.WriteLine("Please Enter a valid ID")
        ID = Console.ReadLine()
        Size = Len(ID)

        If (Size = 5) And ((Left(ID, 1) >= "A") And (Left(ID, 1) <= "Z"))
Then
            Valid = True
            For i = 2 To 5
                Number = Mid(ID, i, 1)
                If (Number < "0") Or (Number > "9") Then
                    Valid = False
                End If
            Next
        End If
    End While

    Console.WriteLine("Please enter preferred name")
    PreferredName = Console.ReadLine()
    Return (ID & "*" & PreferredName)
End Function
```

**Q6 (a): Pascal**

```
function GetInfo() : String;
var
    ID : String;
    PreferredName : String;
    Valid : Boolean;
    Value, Code : Integer;
begin
    Valid := false;
    while not Valid do
    begin
        Write('Please enter a valid ID : ');
        Readln(ID);
        if (Length(ID) = 5) and (ID[1] >= 'A') and (ID[1] <= 'Z') then
            Valid := true;
        Val(Copy(ID, 2, 4), Value, Code);
        if Code <> 0 then
            Valid := false;
        end;
        Write('Please enter preferred name : ');
        Readln(PreferredName);
        GetInfo := ID + '*' + PreferredName;
    end;
end;
```

Free Pascal

```
function GetInfo() : String;
var
    ID : String;
    PreferredName : String;
    Valid : Boolean;
    Value, Code : Integer;
begin
    Valid := false;
    while not Valid do
    begin
        Write('Please enter a valid ID : ');
        Readln(ID);
        if (Length(ID) = 5) and (ID[1] >= 'A') and (ID[1] <= 'Z') and (IsNumber(SubStr(ID, 2, 4))) then
            Valid := true;
        end;
        Write('Please enter preferred name : ');
        Readln(PreferredName);
        result := ID + '*' + PreferredName;
    end;
end;
```

**Q6 (a): Python**

```
def GetInfo() :  
    ID = ""                # string variable  
    PreferredName = ""     # string variable  
    Valid = False          # Boolean variable  
    while not Valid :  
        ID = input("Please enter a valid ID : ")  
        if len(ID) == 5 and ID[0] >= "A" and ID[0] <= "Z" and  
ID[1:].isnumeric() :  
            Valid = True  
    PreferredName = input("Please enter preferred name : ")  
    return ID + "*" + PreferredName
```

**Q6 (b): Visual Basic**

```
Sub TopLevel()  
    Dim Response As String = "Y"  
    Dim InputData As String = ""  
    Dim Success As Boolean = True  
    While Response = "Y"  
        InputData = GetInfo()  
        If Left(InputData, 1) < "N" Then  
            Success = WriteInfo(InputData, "File1.txt")  
        Else  
            Success = WriteInfo(InputData, "file2.txt")  
        End If  
        If Not Success Then  
            Response = "N"  
        Else  
            Console.Write("Enter details for another student? Y/N ")  
            Response = Console.ReadLine()  
        End If  
    End While  
End Sub
```

Q6 (b): Pascal

```
procedure TopLevel();  
var  
    Response : Char;  
    InputData : String;  
    Success : Boolean;  
begin  
    Response := 'Y';  
    while Response = 'Y' do  
        begin  
            InputData := GetInfo();  
            if InputData[1] < 'N' then  
                Success := WriteInfo(InputData, 'File1.txt')  
            else  
                Success := WriteInfo(InputData, 'File2.txt');  
            if not Success then  
                Response := 'N'  
            else  
                begin  
                    Write('Enter details for another student? (Y/N) ');  
                    Readln(Response);  
                end;  
            end;  
        end;  
    end;  
end;
```

**Q6 (b): Python**

```
def TopLevel() :  
    Response = "Y"           # string/character variable  
    InputData = ""           # string variable  
    Success = True           # Boolean variable  
    while Response == "Y" :  
        InputData = GetInfo()  
        if InputData[0] < "N" :  
            Success = WriteInfo(InputData, "File1.txt")  
        else :  
            Success = WriteInfo(InputData, "File2.txt")  
        if not Success :  
            Response = "Y"  
        else :  
            Response = input("Enter details for another student? (Y/N) ")
```


QUESTION 21.



Question	Answer	Marks
5(a)(i)	To test <u>every path</u> through the code / algorithm Accept phrase with equivalent meaning	1
5(a)(ii)	A trace table	1
5(b)(i)	String: - three possible formats for string containing two words: "Cat∇∇Dog" // "Cat∇Dog∇" // "∇Cat∇Dog" Explanation: - When a space character is encountered - NumWords is incremented by 1 OR: - The algorithm counts the spaces - and not the words 1 mark for a string that would give the correct result 2 marks for explanation	3



Question	Answer
5(b)(ii)	String 1: • Output: <code>Number of words : 2</code> Description 1: • Check character at end of string • If not a character, increment variable <code>NumTotal</code> OR: • Add a space at the beginning / end of string • At the start of the algorithm OR: • Change Initialisation of <code>NumWords</code> • to 1 OR: • After the loop • Add 1 to <code>NumWords</code> String 2: • Output: <code>Number of words : 5</code> Description 2: • Detect a space followed by a space • Count as a single space / only increment variable <code>NumTotal</code> once OR: • Replace all double spaces with a single space • Before the loop OR: • After the loop • Subtract 2 from <code>NumWords</code> Many possible solutions. One mark for each correct output One marks for each description bullet point

QUESTION 22.



Question	Answer
5(a)	One mark for each point. A valid string must contain: • At least two // more than one upper case character(s) • At least five // more than four lower case character(s) • More digit characters than 'other' characters



Question	Answer																																																																																										
5(b)(i)	One mark for each area as outlined: <table><tr><th>Index</th><th>NextChar</th><th>Upper</th><th>Lower</th><th>Digit</th><th>Other</th></tr><tr><td></td><td></td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>'J'</td><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td>'i'</td><td></td><td>1</td><td></td><td></td></tr><tr><td>3</td><td>'m'</td><td></td><td>2</td><td></td><td></td></tr><tr><td>4</td><td>'+'</td><td></td><td></td><td></td><td>1</td></tr><tr><td>5</td><td>'S'</td><td>2</td><td></td><td></td><td></td></tr><tr><td>6</td><td>'m'</td><td></td><td>3</td><td></td><td></td></tr><tr><td>7</td><td>'i'</td><td></td><td>4</td><td></td><td></td></tr><tr><td>8</td><td>'t'</td><td></td><td>5</td><td></td><td></td></tr><tr><td>9</td><td>'h'</td><td></td><td>6</td><td></td><td></td></tr><tr><td>10</td><td>'*'</td><td></td><td></td><td></td><td>2</td></tr><tr><td>11</td><td>'9'</td><td></td><td></td><td>1</td><td></td></tr><tr><td>12</td><td>'9'</td><td></td><td></td><td>2</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Index	NextChar	Upper	Lower	Digit	Other			0	0	0	0	1	'J'	1				2	'i'		1			3	'm'		2			4	'+'				1	5	'S'	2				6	'm'		3			7	'i'		4			8	't'		5			9	'h'		6			10	'*'				2	11	'9'			1		12	'9'			2							
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10	'*'				2																																																																																						
11	'9'			1																																																																																							
12	'9'			2																																																																																							

5(b)(ii)	One mark per bullet point: - Returned value is <code>FALSE</code> <code>Digit - Other</code> is not greater than zero // Number of <code>Digit</code> same as <code>Other</code>
----------	---

2

QUESTION 23.



Question	Answer	Marks
4(a)	One mark for each point. Valid string must contain: • at least one '.' characters • one '@' character • more than 5 other characters.	3



Question	Answer																																																																																																														
4(b)(i)	One mark for each area as outlined: <table><tr><th>Index</th><th>NextChar</th><th>NumDots</th><th>NumAsts</th><th>NumOthers</th></tr><tr><td></td><td></td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>'J'</td><td></td><td></td><td>1</td></tr><tr><td>2</td><td>'i'</td><td></td><td></td><td>2</td></tr><tr><td>3</td><td>'m'</td><td></td><td></td><td>3</td></tr><tr><td>4</td><td>'.'</td><td>1</td><td></td><td></td></tr><tr><td>5</td><td>'9'</td><td></td><td></td><td>4</td></tr><tr><td>6</td><td>'9'</td><td></td><td></td><td>5</td></tr><tr><td>7</td><td>'@'</td><td></td><td>1</td><td></td></tr><tr><td>8</td><td>'s'</td><td></td><td></td><td>6</td></tr><tr><td>9</td><td>'k'</td><td></td><td></td><td>7</td></tr><tr><td>10</td><td>'a'</td><td></td><td></td><td>8</td></tr><tr><td>11</td><td>'i'</td><td></td><td></td><td>9</td></tr><tr><td>12</td><td>'l'</td><td></td><td></td><td>10</td></tr><tr><td>13</td><td>'.'</td><td>2</td><td></td><td></td></tr><tr><td>14</td><td>'c'</td><td></td><td></td><td>11</td></tr><tr><td>15</td><td>'o'</td><td></td><td></td><td>12</td></tr><tr><td>16</td><td>'m'</td><td></td><td></td><td>13</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>	Index	NextChar	NumDots	NumAsts	NumOthers			0	0	0	1	'J'			1	2	'i'			2	3	'm'			3	4	'.'	1			5	'9'			4	6	'9'			5	7	'@'		1		8	's'			6	9	'k'			7	10	'a'			8	11	'i'			9	12	'l'			10	13	'.'	2			14	'c'			11	15	'o'			12	16	'm'			13																				
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9	'k'			7																																																																																																											
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16	'm'			13																																																																																																											
4(b)(ii)	TRUE																																																																																																														



Question	Answer
4(c)	One mark for string and one mark for correct explanation. Same for second answer providing it results in a different path through the algorithm. Correct answers may be: • without the correct number of '.' • without the correct number of '@' • without the correct number of 'other characters'