5 A company creates two new websites, Site X and Site Y, for selling bicycles.



Various programs are to be written to process the sales data.

These programs will use data about daily sales made from Site X (using variable SalesX).

Data for the first 28 days is shown below.

	SalesDate	SalesX	SalesY
1	03/06/2015	0	1
2	04/06/2015	1	2
3	05/06/2015	3	8
4	06/06/2015	0	0
5	07/06/2015	4	6
6	08/06/2015	4	4
7	09/06/2015	5	9
8	10/06/2015	11	9
9	11/06/2015	4	1
28	01/07/2015	14	8

(a) Ivai	ne me dala shucidie lo b	e used in a program for Sale	esa.	

(b) The programmer writes a program from the following pseudocode design.



(i) Trace the execution of this pseudocode by completing the trace table below.

х	DayNumber	OUTPUT
0		

(ii)	Describe, in detail, what this algorithm does.	
		[0]

[4]

(c) The company wants a program to output the total monthly sales for one websites.



The programmer codes a function with the following function header:

FUNCTION MonthlyWebSiteSales(ThisMonth: INTEGER, ThisSite: CHAR)

RETURNS INTEGER

The function returns the total number of bicycles sold for the given month and website.

The function will use the following:

Identifier	Data type	Description
ThisMonth	INTEGER	Represents the month number e.g. 4 represents April
ThisSite	CHAR	Coded as: X for website X Y for Website Y

- (i) Give the number of parameters of this function. [1]
- (ii) Some of the following function calls may be invalid.

Mark each call with:

- a tick (✓), for a valid call
- a cross (X), for an invalid call

For any function calls which are invalid, explain why.

Function call	Tick (✓) /cross (✗)	Explanation (if invalid)
MonthlyWebSiteSales(1, "Y")		
MonthlyWebSiteSales(11, 'X', 'Y')		
MonthlyWebSiteSales(12, 'X')		

(d) The company decides to offer a discount on selected dates. A program is we the dates on which a discount is offered.



The program creates a text file, DISCOUNT_DATES (with data as shown), for a nu consecutive dates.

03/06/2015	TRUE
04/06/2015	FALSE
05/06/2015	FALSE
06/06/2015	FALSE
07/06/2015	FALSE
08/06/2015	FALSE
09/06/2015	FALSE
10/06/2015	TRUE
11/06/2015	FALSE
	-
(
)	
01/07/2015	FALSE

Each date and discount indicator is separated by a single <Space> character.

The discount indicators are:

- FALSE indicates a date on which no discount is offered
- TRUE indicates a date on which a discount is offered

A programming language has the built-in function CONCAT defined as follows:

```
CONCAT(String1 : STRING, String2 : STRING [, String3 : STRING] )

RETURNS STRING

For example:

CONCAT("San", "Francisco") returns "SanFrancisco"

CONCAT("New", "York", "City") returns "NewYorkCity"
```

The use of the square brackets indicates that the parameter is optional.

The following incomplete pseudocode creates the text file ${\tt DISCOUNT_DATES}.$



Complete the pseudocode.

OPENFILE "DISCOUNT_DATES" FOR
INPUT
WHILE NextDate <>"XXX"
INPUT Discount
= CONCAT(NextDate, " ", Discount)
WRITEFILE "DISCOUNT_DATES", NextLine
INPUT NextDate
OUTPUT "File now created"
CLOSEFILE [4]



Question 5(e) continues on page 18.

(e) The DISCOUNT_DATES text file is successfully created.

The company now wants a program to:

- key in a date entered by the user
- search the text file for this date
- if found, output one of the following messages:
 - o "No discount on this date"
 - o "This is a discount date"
- if not found, output "Date not found"
- (i) Add to the identifier table to show the variables you need for this new program.

Identifier	Data type	Description
DISCOUNT_DATES	FILE	Text file to be used

(ii)	Write the program code.
	Do not include any declaration or comment statements for the variables used.
	Programming language

QUESTION 7.

7 ASCII character codes are used to represent a single character.



Part of the code table is shown below.

ASCII code table (part)

Character	Decimal	Character	Decimal	Character	Decimal
<space></space>	32	I	73	R	82
А	65	J	74	S	83
В	66	K	75	Т	84
С	67	L	76	U	85
D	68	M	77	V	86
Е	69	N	78	W	87
F	70	0	79	Х	88
G	71	Р	80	Y	89
Н	72	Q	81	Z	90

Some pseudocode statements follow which use the built-in functions below:

ONECHAR (ThisString: STRING, Position: INTEGER) RETURNS CHAR returns the single character at position Position (counting from the start of the string with value 1) from the string ThisString.

For example: ONECHAR ("Barcelona", 3) returns 'r'.

CHARACTERCOUNT (ThisString: STRING) RETURNS INTEGER returns the number of characters in the string ThisString. For example: CHARACTERCOUNT ("BRAZIL") returns 6.

CHR (ThisInteger: INTEGER) RETURNS CHAR returns the character with ASCII code ThisInteger.

For example: CHR (65) returns character 'A'.

ASC (ThisCharacter : CHAR) RETURNS INTEGER returns the ASCII value for character ThisCharacter. For example: ASC ('A') returns 65.

(a) Show the values stored by variables ${\tt A},\,{\tt B},\,{\tt C}$ and ${\tt D}.$

The & operator is used to concatenate two strings.

Num1 ← 15	
A ← CHR(67) & CHR(65) & CHR(84)	
$B \leftarrow ASC('P') - ASC('F') + 3$	
C ← ASC(ONECHAR("BISCUITS", 3))	
D ← CHARACTERCOUNT("New York City")	+ 2

(i)	Α		[1]
-----	---	--	-----

(b) A program is to be written which accepts a string and then calculates a number this string. The input string and the calculated value are then to be sent to a remover a communications link.



Study the following pseudocode:

```
OUTPUT "Enter string"
INPUT MyString
StringTotal ← 0

FOR i ← 1 TO CHARACTERCOUNT(MyString)
NextNum ← ASC(ONECHAR(MyString, i))
StringTotal ← StringTotal + NextNum
ENDFOR
OUTPUT MyString, StringTotal

Write the above pseudocode algorithm as program code.

There is no need to show the declaration of variables or column.
```

There is no need to show the declaration of variables or comment statements.
[6]
Explain the purpose of sending the value of $StringTotal$ to the remote computer, in addition to $MyString$.

QUESTION 8.

7 ASCII character codes are used to represent a single character.



Part of the code table is shown below.

ASCII code table (part)

Character	Decimal	Character	Decimal	Character	Decimal
<space></space>	32	I	73	R	82
Α	65	J	74	S	83
В	66	K	75	Т	84
С	67	L	76	U	85
D	68	М	77	V	86
Е	69	N	78	W	87
F	70	0	79	Х	88
G	71	Р	80	Y	89
Н	72	Q	81	Z	90

Some pseudocode statements follow which use these built-in functions:

CHARACTERCOUNT (ThisString: STRING) RETURNS INTEGER returns the number of characters in the string ThisString.

For example: CHARACTERCOUNT ("South Africa") returns 12.

CHR (ThisInteger: INTEGER) RETURNS CHAR returns the character with ASCII value ThisInteger. For example: CHR (66) returns 'B'.

ASC (ThisCharacter: CHAR) RETURNS INTEGER returns the ASCII value for character ThisCharacter. For example: ASC ('B') returns 66.

(a) Give the values assigned to the variables A, B, C and D.

The & operator is used to concatenate two strings.

The expression could generate an error; if so, write ERROR.

Num1 ← 5
$A \leftarrow ASC('F') + Num1 + ASC('Z')$
B ← CHR(89) & CHR(69) & CHR(83)
C ← CHARACTERCOUNT(B & "PLEASE")
D ← ASC(ONECHAR("CURRY SAUCE", 7))



(a)

5 Toni has a large collection of jazz CDs that are stored in different places. She where the CDs are stored. She decides to write a program to do this.



The program must store the data in a file, MyMusic.

(i)	Why is a file r	needed?	
			[1]
(ii)	MyMusic is a	a text file with the data for each CD as one line of text.	
	Data for a typ	pical CD are:	
	Title: Artist: Location:	Kind of Green Miles Coltrane Rack1-5	
	The line will b	pe formed by concatenating the three data items.	
	For the exam	ple above, the line stored will be:	
	Kind of Gr	reenMiles ColtraneRack1-5	
	Describe a pr	roblem that might occur when organising the data in this way.	
	Describe a po	ossible solution.	

[4]

(b) Toni must input the data into the file for all of her CDs.

A procedure, InputData, is needed to do this.

Toni designs the procedure and chooses the following identifiers:

Identifier	Data type
CDTitle	STRING
CDArtist	STRING
CDLocation	STRING

The procedure repeatedly performs the following steps:

- input a CD title (A rogue value of "##" is to be used to end the input)
- input the artist
- input the location
- create the text line
- write the text line to the file

When the rogue value is encountered the file is closed.



Write program code for the procedure InputData. Visual Basic and Pascal: You should include declaration statements for variables. Python: You should show a comment statement for each variable used with its data Programming language

QUESTION 10.

11

5 Claudia stores her large collection of music CDs in different places. Claudia wants she stores each CD. She decides to write a program to do this.



Data items for a typical CD are:

Title: Kind of Green
Artist: Miles Coltrane
Location: Rack3-23

The data is to be stored in a text file, MyMusic. Each line of the text file will be a string, formed by concatenating the three data items.

Before concatenation, the title and artist will each be made into a fixed-length string of 40 characters. Space characters may need to be added to each data item.

The location is always 8 characters long.

(a)	(i)	Explain the benefit of making the stored data into fixed-length strings.				
		State a drawback of this file design.				
		[3]				

(ii) When Claudia buys a new CD, the CD data must be added to the existing She has written a procedure in pseudocode. This has the following statements:



[3]

OPENFILE "MyMusic" FOR WRITE WRITEFILE "MyMusic", OutputString CLOSEFILE "MyMusic"

There is a problem with the logic of this pseudocode.
State the problem.
Identify the effect it will have if the final code is implemented in this way.
Give a possible solution.

(b) Claudia needs to output a list of all the CDs in a particular location.

She designs a procedure, OutputLocationList, to do this. She also chooses the following identifiers:

Identifier	Data type
CDTitle	STRING
CDArtist	STRING
CDLocation	STRING

The procedure will:

- prompt for the name of the location
- input the location (such as "Rack3-23")
- search the file for all CDs at this location
- output the title and artist of each CD found
- output the total number of CDs found at that location (such as "17 CDs found")

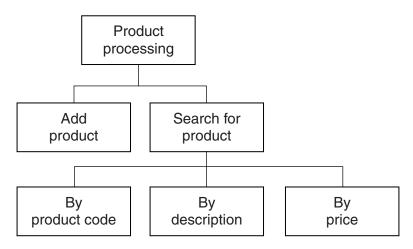
Write program code for the procedure OutputLocationList.
Visual Basic and Pascal: You should include the declaration statements for variable Python: You should show a comment statement for each variable used with its data is
Programming language
[10]

4 A company employs Ahmed as a programmer.

- (a) At College, before joining the company, Ahmed used two items of software for pro-
 - a text editor
 - a compiler

	Des	cribe how he could have developed programs using these software tools.	
	Incl	ude in the description the terms 'object code' and 'source code'.	
		[
	•••••	······································	J
(b)	Ahn	ned now uses an Integrated Development Environment (IDE) for programming.	
	(i)	State one feature an IDE provides to help with the identification of syntax errors.	
		[[1]
	(ii)	State one feature an IDE provides to carry out white box testing.	
		[1]

(c) The company maintains a file of product data. Ahmed is to write a program to add a new product and search for a product based on the structure diagram shown:



The program records the following data for each product:



- product code
- product description
- product retail price

The text file PRODUCTS stores each data item on a separate line, as shown below:

File PRODUCTS

0198
Plums(10kg)
11.50
0202
Onions(20kg)
10.00
0376
Mango chutney(1kg)
02.99
0014
Mango (10kg)
12.75

The program uses the variables shown in the identifier table.

Identifier	Data type	Description
PRODUCTS	TEXT FILE	Storing the code, description and retail price for all current products
PCode	ARRAY[1:1000] OF STRING	Array storing the product codes
PDescription	ARRAY[1:1000] OF STRING	Array storing the product descriptions
PRetailPrice	ARRAY[1:1000] OF REAL	Array storing the product retail prices
i	INTEGER	Array index used by all three arrays

	15		
(i)	The first operation of the program is to read a and write them into the three 1D arrays.	Ill the product data held in	
	Complete the pseudocode below.		
	OPEN		
	i ← 1		
	WHILE		
	READFILE ("PRODUCTS",		
	READFILE ("PRODUCTS",		
	READFILE ("PRODUCTS",		
	ENDWHILE		
	CLOSE "PRODUCTS"		
	OUTPUT "Product file contents writ	ten to arrays"	[5
			وا
When Ahmed designed the PRODUCTS file,		File PRODUCTS	
_	considered the alternative file structure own opposite.	0198 Plums(10kg)	L1.50
It s	tores one product per line in the text file.	0202 Onions(20kg)	10.00
		0376 Mango chutney(1kg)()2.99
		0014 Mango(10kg)	12.75
(ii)	State one benefit and one drawback of this file	a design	

Benefit

Drawback

.....[2]

(d) To code the 'Search by product code' procedure, Ahmed draws a structure codifferent stages.

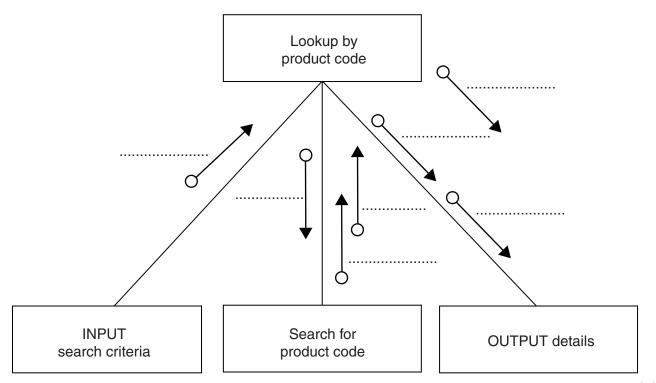


The procedure uses the variables shown in the identifier table.

Identifier	Data type	Description
SearchCode	STRING	Product code input by the user
ThisIndex	INTEGER	Array index position for the corresponding product
ThisDescription	STRING	Product description found
ThisRetailPrice	REAL	Product retail price found

You can assume that before the procedure is run, all the product data is read from file PRODUCTS and then stored in three 1D arrays as described in part (c)(i).

Label the structure chart to show the input(s) and output(s).



(e) A first attempt was made at writing the 'Search for product code' module.

Ahmed designs this as a function ProductCodeSearch.



The function returns an integer value as follows:

- if the product code is found, it returns the index position of the 1D array PCode be, searched
- if the product code is not found, the function returns -1

Write program code for function ProductCodeSearch.

Python: You should show a comment statement for each variable used with its data type.
Programming language

QUESTION 12.

5 A team keeps a record of the scores made by each of their eight players in a nun.



The data in the two tables below shows:

- the scores of the eight players after twenty games
- the eight player names.

	1	2	3	 8
1	12	17	67	31
2	35	82	44	29
3	61	39	80	17
4	81	103	21	11
5	56	0	98	4
19	45	6	81	77
20	12	11	3	6

1	Vorma
2	Ravi
3	Chada
4	Nigam
5	Bahri
6	Smith
7	Goyal
8	Lata

The team wants a computer program to input and record the player data.

(a) A programmer designs the following pseudocode for the input of a player's score from one game.

02	INPUT	PlayerNumber
03	INPUT	PlayerGameScore
04	Player	Score[GameNumber, PlayerNumber] ← PlayerGameScore
Des	cribe the	data structure the programmer has used for the storage of all player scores

(b) The player names are permanently stored in a text file NAMES.TXT, with or

line	. The player names will be read by the program and stored in a 1D array.
	e design given in part (a) will be expanded so that the user is prompted for the ne instead of the player number. Step 02 now becomes:
02. 02. 02.	.2 INPUT ThisPlayerName
(i)	State the computing term for the expansion of one or more steps in the original design.
	[1]
(ii)	Write the program code for step 02.1
	Visual Basic and Pascal: You should include the declaration statements for variables. Python: You should show a comment statement for each variable used with its data type.
	Programming language

(iii) Program code is to be designed and written for step 02.3



The program will use these identifiers:

Identifier	Data type	Description
PlayerName	ARRAY[1 : 8] OF STRING	Stores the player names (read from the file)
ThisPlayerName	STRING	Input by the user (step 02.2)
Found	BOOLEAN	Flags when ThisPlayerName is found when searching the PlayerName array
i	INTEGER	Array index

write program code to carry out the linear search for step 02.3
There is no requirement to declare or comment on variables used.
Programming language

(c) The team wants the program to produce a report, with the following specifical



The program outputs the total number of player scores that are:

- 50 and over but less than 100
- 100 or higher.

You can assume that before the section runs, the program has assigned all eight player scores to the PlayerScore data structure.

A first attempt at the pseudocode is shown below:

```
01 Total50 ← 0
02 Total100 \leftarrow 0
03 FOR PlayerIndex \leftarrow 1 TO 8
04
      FOR GameIndex \leftarrow 1 TO 20
05
        IF PlayerScore[GameIndex, PlayerIndex] > 100
06
          THEN
07
             Total100 \leftarrow Total100 + 1
8 0
          ELSE
             IF PlayerScore[GameIndex, PlayerIndex] > 50
09
10
               THEN
                 Total50 ← Total50 + GameIndex
11
12
             ENDIF
13
        ENDIF
      ENDFOR
14
15 ENDFOR
16 OUTPUT Total50
17 OUTPUT Total100
(i) Describe the control structure used in lines 03 and 04 and lines 14 and 15.
```

.....[2]

(ii) Consider the following two statements.



Write either TRUE **or** FALSE next to each statement.

Statement	TRUE or FALSE
The pseudocode considers all the scores for a player, before progressing to the next player.	
The pseudocode considers all scores in a game, before progressing to the next game.	

		[1
(iii)	The programmer has made logic errors in the design.	
	State a line number at which an error occurs.	
	Explain the error or write the corrected pseudocode statement.	
	Line number	
	Explanation	
		Γ 4
		[

6 A multi-user computer system makes use of passwords.



To be valid, a password must comply with the following rules:

- at least two lower-case alphabetic characters
- at least two upper-case alphabetic characters
- at least three numeric characters
- alpha-numeric characters only

A function, ValidatePassword, is needed to check that a given password follows these rules. This function takes a string, Pass, as a parameter and returns a Boolean value:

- TRUE if Pass contains a valid password
- FALSE otherwise.
- (a) Write program code to implement the new function ValidatePassword.

Visual Basic and Pascal: You should include the declaration statements for variables. Python: You should show a comment statement for each variable used with its data type. Programming language Program code Visual Basic and Pascal: You should include the declaration statements for variables.

Write program code for the procedure SearchFile.

Python: You should show a comment statement for each variable used with its data type. Programming language Program code

QUESTION 14.

A computerised vehicle licensing system stores details about vehicles and their re-(number plates or license plates).



To be valid, a vehicle registration must comply with the following rules:

- It must be between six and nine characters long.
- Characters 1 to 3 are upper case alphabetic characters.
- Characters 4 to 5 are numeric characters.
- Remaining characters are upper case alphabetic.

A function, ValidateRegistration is needed to check that a given registration mark follows these rules. This function takes a string, Registration as a parameter and returns a Boolean value:

- TRUE if it is a valid registration
- FALSE otherwise.

Visual Basic and Pascal: You should include the declaration statements for variables.

(a) Write program code to implement the new function, ValidateRegistration.

Python: You should show a comment statement for each variable used with its data type. Programming language Program code

(b)	A procedure, $logEvents$, is required to add the log entry data from $logArray$ to the existing text file, $loginFile.txt$.
	Unused array elements are assigned the value "****". These can occur anywhere in the array and should not be written to the file.
	Write program code for the procedure LogEvents.
	Visual Basic and Pascal: You should include the declaration statements for variables. Python: You should show a comment statement for each variable used with its data type.
	Programming language
	Program code
	[8]

QUESTION 15.

3 (a) A multi-user computer system stores information about users. It use UserNameArray, of type STRING. There are 100 elements in the array.



The format of the string in each element of the array is as follows:

<UserID><UserName>

- UserID is a six-character string of numerals.
- UserName is a variable-length string.

Write pseudocode for a procedure, BubbleSort, to perform an efficient bubble sort on UserNameArray. The array is to be sorted in ascending order of UserID.
You should assume that UserNameArray has been declared as a global variable.

(b) The value of UserID should be unique for each user but a problem have repeated UserID values may have been issued.



The array is sorted by UserID, so any repeated UserID values will appear in conarray elements.

A procedure, FindRepeats is required.

This will:

- compare each element with the previous element and output the <code>UserID</code> and <code>UserName</code> if the <code>UserID</code> is repeated
- output the total number of UserIDs that are repeated.

For example, the UserNameArray contains the following entries.

Array element	Comment
122222Jim Moriarty	
123456Fred Smith	
123456Eric Sykes	Repeated User ID
123456Kevin Turvey	Repeated User ID
222244Alice Chan	
222244Myra Singh	Repeated User ID
333333Yasmin Halim	

For this example, the output is:

123456Eric Sykes 123456Kevin Turvey 222244Myra Singh There are 3 repeated UserIDs

If no repeated UserIDs are found, the output is:

The array contains no repeated UserIDs

You should assume that UserNameArray has been declared as a global varia.					
Visual Basic and Pascal: You should include the declaration statements for variables Python: You should show a comment statement for each variable used with its data type					
Programming language					
Program code					
[8]					

(c)	(i)	The FindRepeats procedure forms part of a program.	
		Name three stages in a program development cycle.	
		1	
		2	
		3	
			[3]
((ii)	The program containing FindRepeats will be created using an IDE.	
		State what is meant by IDE.	
			.[1]
(i	iii)	Name two features provided by an IDE that assist in the program development cycle	
		1	
		2	
			[2]
(i	iv)	The procedure, FindRepeats, is written assuming there are 100 elements UserNameArray.	in
		In the main program, the global array, <code>UserNameArray</code> , has been declared with a 50 elements.	only
		State the type of error this will cause.	
			[1]

4 Programming languages provide built-in functions to generate random numbers.

To be truly random, the frequency of each number generated should be the same.



You are required to write program code to test the random number generator of your language.

The test should:

- generate a given number of random numbers between 1 and 10 inclusive
- keep a count of the number of times each number is generated
- calculate the expected frequency of each number 1 to 10
- output the actual frequency of each number 1 to 10
- output the difference between the actual frequency and the expected frequency.

The program code should be written as a procedure. In pseudocode, the procedure heading will be:

```
PROCEDURE TestRandom (Repetitions AS INTEGER)
```

The parameter, Repetitions, contains a value representing the total number of random numbers that should be generated.

The following example shows the expected output for the procedure call, TestRandom (200).

The expected frequency is 20.

Number	Fraguanau	Difference
Number	Frequency	DILLETEUCE
1	17	-3
2	21	1
3	12	-8
4	28	8
5	20	0
6	19	-1
7	21	1
8	16	-4
9	24	4
10	22	2

(a)	Write program code for the procedure, TestRandom.
	Visual Basic and Pascal: You should include the declaration statements for variab. Python: You should show a comment statement for each variable used with its data.
	Programming language
	Program code

(b)	Name three features of a typical IDE that would help a programmer to debug
	Explain how each of these could be used in the debugging of the TestRandom from part (a).
	Feature 1
	Explanation
	Feature 2
	Explanation
	'
	Feature 3
	Explanation
	[6]
(c)	The procedure is developed and run using the call <code>TestRandom(200)</code> . No system errors are produced.
	To ensure that the procedure works correctly, you need to check the output.
	Describe two checks you should make to suggest the program works correctly.
	1
	2

QUESTION 17.

4 Part of a program written in pseudocode is shown.



```
01 DECLARE NumElements : INTEGER
10 FUNCTION ScanArray(SearchString: STRING) RETURNS INTEGER
11
12
      DECLARE ArrayIndex : INTEGER
13
      DECLARE ArrayString : STRING
      DECLARE NumberFound : INTEGER
14
15
      ArrayIndex \leftarrow 0
16
      NumberFound \leftarrow 0
17
18
19
      FOR ArrayIndex ← 1 TO NumElements
20
          ArrayString ← ResultArray[ArrayIndex, 1]
21
          IF ArrayString = SearchString
22
             THEN
                CALL SaveToFile(ArrayString)
23
24
                NumberFound ← NumberFound + 1
25
          ENDIF
26
      ENDFOR
2.7
28
      RETURN NumberFound
29
30 ENDFUNCTION
```

(a) (i) Examine the pseudocode and complete the following table.

Answer

The identifier name of a global integer	
The identifier name of a user-defined procedure	
The line number of an unnecessary statement	
The scope of ArrayString	

[4]

o)	sensitive. For example, comparing "Aaaa" with "AAAa" should evaluate to TRUL
	Write program code to implement the amended ScanArray() function.
	Visual Basic and Pascal: You should include the declaration statements for variables. Python: You should show a comment statement for each variable used with its data type.
	Programming language
	Program code

.....[6]

(c)	The function ScanArray() is one of a number of sub-tasks within a program
	Name the process that involves the splitting of a problem into sub-tasks and advantages of this approach.
	Name
	Advantage 1
	Advantage 2
	[3]
(d)	${\tt ResultArray} \ \ \textbf{is a 2D array of type} \ \ {\tt STRING}. \ \ \textbf{It represents a table containing 100 rows and 2 columns}.$
	Write program code to declare ResultArray and set all elements to the value '*'.
	Programming language
	Program code
	[3]



Question 5 begins on the next page.

QUESTION 18.

Nadine is developing a program to store the ID and preferred name for each student Pradeep uses the preferred name "Prad".



The program will:

- 1. prompt and input a valid user ID and a preferred name
- 2. write the user ID and preferred name to one of two files
- 3. allow the user to end the program or repeat from step 1.

The program will consist of three separate modules. Each module will be implemented using either a procedure or a function.

Nadine has defined the modules as follows:

Module	Description
TopLevel()	Call GetInfo() to obtain a string containing a valid user ID and a preferred name
	• Call WriteInfo() to write the string to either File1.txt or File2.txt depending on the first character of the user ID as follows:
	o 'A' to 'M': writes to File1.txt
	o 'N' to 'Z': writes to File2.txt
	For example, a string with a user ID of "G1234" writes to File1.txt
	End the program if the file write was unsuccessful
	 Input (Y/N) to either repeat for the next user ID or to end the program
GetInfo()	Input a user ID and repeat until the user ID is valid
	 Input a preferred name. This will be an empty string if no preferred name is input.
	Concatenate the user ID and preferred name using a '*' character as a separator and return this string
WriteInfo()	Open the file
	Append the concatenated string to the file
	Close the file
	Return a Boolean value:
	o TRUE if the file write was successful
	o FALSE if the file write failed, for example, if the disk was full

A valid user ID:

- is five characters in length
- has a single upper case alphabetic character followed by four numeric characters, for example "G1234".

Nadine has decided that global variables and nested modules must not be used.

Nadine wants all inputs to have suitable prompts.

(a)	Write program code for the module GetInfo().
	Visual Basic and Pascal: You should include the declaration statements for variab. Python: You should show a comment statement for each variable used with its data.
	Programming language
	Program code

.....[8]

(b)	Write program code for the module TopLevel ().
	Visual Basic and Pascal: You should include the declaration statements for variable Python: You should show a comment statement for each variable used with its data.
	Programming language
	Program code

.....[8]

(c)	Write pseudocode for the module declaration of WriteInfo().	
		[31

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QUESTION 19.

A text file, StudentContact.txt, contains a list of names and telephone numin a school. Not all students in the school have provided a contact telephone number their name will not be in the file.



Each line of the file is stored as a string that contains a name and telephone number, separathe asterisk character ('*') as follows:

```
<Name>'*'<TelNumber>, for example:
```

```
"Bill Smith*081234567"
```

A 1D array, ClassList, contains the names of students in a particular class. The array consists of 40 elements of string data type. You can assume that student names are unique. Unused elements contain the empty string "".

A program is to be written to produce a **new** text file, ClassContact.txt, containing student names and numbers for all students in a particular class.

For each name contained in the ClassList array, the program will:

- search the StudentContact.txt file
- copy the matching string into ClassContact.txt if the name is found
- write the name together with "*No number" into ClassContact.txt if the name is not found.

The program will be implemented as three modules. The description of these is as follows:

Module	Description
ProcessArray()	Check each element of the array:
	 Read the student name from the array
	 Ignore unused elements
	o Call SearchFile() with the student name
	 If the student name is found, call AddToFile() to write the student details to the class file
	 If the student name is not found, call AddToFile() to write a new string to the class file, formed as follows:
	<name>"*No number"</name>
	Return the number of students who have not provided a telephone number
SearchFile()	Search for a given student name at the start of each line in the file StudentContact.txt:
	o If the search string is found, return the text line from StudentContact.txt
	 If the search string is not found, return an empty string
AddToFile()	Append the given string to a specified file, for example, AddToFile(StringName, FileName)

(b)	(i)	Write a test string containing two words that gives the output:	
		Number of words : 2	
		Use the symbol ' ∇ ' to represent each space character in your test string.	
		Explain why the algorithm gives the output shown above.	
		String	
		Explanation	
		[3]	
	(ii)	Nigel tested the procedure with the strings:	
		String 1: "Red ∇ and ∇ Yellow" String 2: "Green ∇ Vand ∇ VPink ∇ "	
		Give the output that is produced for each of the strings.	
		Describe the changes that would need to be made to the algorithm to give the correct output in each case.	
		Do not write pseudocode or program code.	
		String 1	
		Description	
		String 2	
		Description	

[6]

QUESTION 20.

6 Account information for users of a library is held in one of two text files; UserLis UserListNtoZ.txt



The format of the data held in the two files is identical. Each line of the file is stored as a scount number, name and telephone number separated by the asterisk characteristics of the file is stored as a scount number, name and telephone number separated by the asterisk characteristics.

```
<Account Number>'*'<Name>'*'<Telephone Number>
```

An example of one line from the file is:

```
"GB1234*Kevin Mapunga*07789123456"
```

The account number string may be **six** or **nine** characters in length and is **unique for each person**. It is made up of alphabetic and numeric characters only.

An error has occurred and the same account number has been given to different users in the two files. There is **no** duplication of account numbers **within each individual file**.

A program is to be written to search the two files and to identify duplicate entries. The account number of any duplicate found is to be written to an array, <code>Duplicates</code>, which is a 1D array of 100 elements of data type <code>STRING</code>.

The program is to be implemented as several modules. The outline description of three of these is as follows:

Module	Outline description				
ClearArray()	Initialise the global array Duplicates. Set all elements to the empty string.				
	•	Read each line from the file UserListAtoM.txt			
		• Check whether the account number appears in file UserListNtoZ.txt using SearchFileNtoZ()			
FindDuplicates()		 If the account number does appear then add the account number to the array. 			
	•	Output an error message and exit the module if there are more duplicates than can be written to the array.			
CoarabeiloN+o7/\	•	Search for a given account number in file UserListNtoZ.txt			
SearchFileNtoZ()		• If found, return TRUE, otherwise return FALSE			

a)	State one reason for storing data in a file rather than in an array.	
		[1]

(b)	Write program code for the module SearchFileNtoZ().
	Visual Basic and Pascal: You should include the declaration statements for variab. Python: You should show a comment statement for each variable used with its data.
	Programming language
	Program code

(c)	Write pseudocode for the module FindDuplicates().						
	The module description is given in the table on page 12.						

	•••••		
			[8]
<i>(</i> 1)			
(d)	Cle 1Da	earArray() is to be modified to make it general purpose. It will be used to initicarray of data type STRING to any value.	alise any
	It wi	ill now be called with three parameters as follows:	
		1. The array	
		2. The number of elements3. The initialisation string	
	You	should assume that the lower bound is 1.	
	(i)	Write pseudocode for the modified ClearArray() procedure.	
			[3]
	(ii)	Write program code for a statement that calls the modified ClearArray() p	rocedure
	(,	to clear the array Duplicates to "Empty".	10000010
		Programming language	
		Program code	
			[2]

Appendix



Built-in functions (pseudocode)

Each function returns an error if the function call is not properly formed.

MID (This String: STRING, x: INTEGER, y: INTEGER) RETURNS STRING returns a string of length y starting at position x from This String

Example: MID("ABCDEFGH", 2, 3) returns "BCD"

LENGTH (ThisString: STRING) RETURNS INTEGER returns the integer value representing the length of ThisString

Example: LENGTH ("Happy Days") returns 10

LEFT (ThisString: STRING, x: INTEGER) RETURNS STRING returns leftmost x characters from ThisString

Example: LEFT ("ABCDEFGH", 3) returns "ABC"

RIGHT (ThisString: STRING, x : INTEGER) RETURNS STRING returns rightmost x characters from ThisString

Example: RIGHT("ABCDEFGH", 3) returns "FGH"

INT(x : REAL) RETURNS INTEGER

returns the integer part of x

Example: INT (27.5415) returns 27

NUM_TO_STRING(x : REAL) RETURNS STRING returns a string representation of a numeric value.

Note: This function will also work if ${\tt x}$ is of type ${\tt INTEGER}$

Example: NUM_TO_STRING(87.5) returns "87.5"

STRING_TO_NUM(x : STRING) RETURNS REAL

returns a numeric representation of a string.

Note: This function will also work if x is of type CHAR

Example: STRING TO NUM("23.45") returns 23.45

ASC (ThisChar : CHAR) RETURNS INTEGER

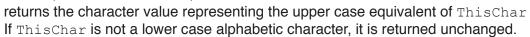
returns the ASCII value of ThisChar

Example: ASC ('A') returns 65

CHR (x : INTEGER) RETURNS CHAR returns the character whose ASCII value is $\mathbf x$

Example: CHR (87) returns 'W'

UCASE (ThisChar : CHAR) RETURNS CHAR





Example: UCASE('a') returns 'A'

Operators (pseudocode)

Operator	Description				
&	Concatenates (joins) two strings Example: "Summer" & " " & "Pudding" produces "Summer Pudding"				
AND	Performs a logical AND on two Boolean values Example: TRUE AND FALSE produces FALSE				
OR	Performs a logical OR on two Boolean values Example: TRUE OR FALSE produces TRUE				

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QUESTION 21.

A text file, Library.txt, stores information relating to a book collection. The pieces of information about each book on separate lines of the file, as follows:



Line n: <Book Title>
Line n + 1: <Author Name>

Line n + 2: <ISBN>
Line n + 3: <Location>

Information is stored as data strings.

Information relating to two books is shown:

File line	Data
100	"Learning Python"
101	"Brian Smith"
102	"978-14-56543-21-8"
103	"BD345"
104	"Surviving in the mountains"
105	"C T Snow"
106	"978-35-17635-43-9"
107	"ZX001"

(a) (i) A function, FindBooksBy(), will search Library.txt for all books by a given author.

The function will store the Book Title and Location in the array Result, and will return a count of the number of books found.

Array Result is a global 2D array of type STRING. It has 100 rows and 2 columns.

Write pseudocode to declare the array Result.	
	[3]

- (ii) Function FindBooksBy() will:
 - receive the Author Name as a parameter
 - search Library.txt for matching entries
 - store the Book Title and Location of matching entries in the Result array
 - return an integer value giving the number of books by the author that were found.

Write program code for the function FindBooksBy().
Visual Basic and Pascal: You should include the declaration statements for variable used with its of
Programming language
Program code

		[0]
 	 	 181

(b) The function FindBooksBy() has already been called and has stored values in the array Result.

The procedure, <code>DisplayResults()</code>, will output the information from the array.

The procedure receives the following two parameters:

- a string containing the author name
- an integer value representing the number of books found

The output should be formatted as in the following example:

Books written by: Brian Smith

Title Location
Learning Python BD345
Arrays are not lists CZ562
Learning Java CZ589

Number of titles found: 3

If no books by the author are found, the following should be output:

Search found no books by: Brian Smith

Write pseudocode for the procedure DisplayResults().	
Refer to the Appendix on page 16 for the list of built-in functions and operators.	