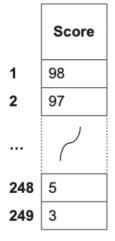
В	(a)	State two factors that may affect the performance of a sorting algorithm.	

(b) The given algorithm is a simple bubble sort that arranges a set of scores stored in a one-dimensional array into descending order, and orders the corresponding students' names stored into a two-dimensional array in the same order as the scores. All the arrays are indexed from 1.

The contents of both arrays after sorting are shown.



ENDWHILE

	Name		
	1	2	
1	Smithfield	Tom	
2	Johnson	Jane	
	7	ر (
248	Peters	Jade	
249	Allen	John	

```
YearSize ← 249
Flag ← TRUE
WHILE Flag = TRUE
    Flag ← FALSE
    FOR Student ← 1 TO YearSize - 1
        IF Score[Student] < Score[Student + 1] THEN</pre>
           Temp1 ← Score[Student]
           Temp2 ← Name[Student,1]
           Temp3 ← Name[Student,2]
           Score[Student] ← Score[Student + 1]
           Name[Student,1] ← Name[Student + 1,1]
           Name[Student, 2] \leftarrow Name[Student + 1, 2]
           Score[Student + 1] ← Temp1
           Name[Student + 1,1] \leftarrow Temp2
           Name[Student + 1,2] \leftarrow Temp3
           Flag ← TRUE
        ENDIF
    NEXT Student
```

Write an algorithm, using pseudocode, that will perform the same task using an insertion sort.
[6]

10	(a)	State three essential features of recursion.
		1
		2
		3
		[3]
	(b)	Explain the reasons why a stack is a suitable Abstract Data Type (ADT) to implement recursion.
		[3]
	(c)	Identify two ADTs other than a stack.
		1
		2[2]

(d) The function StackFull() checks whether a stack is full.

The function uses the variable <code>TopOfStack</code> to represent the pointer to the most recent position used on the stack, and the variable <code>Max</code> to represent the maximum size of the stack. Assume <code>TopOfStack</code> and <code>Max</code> are global variables.

FUNCTION StackFull() RETURNS BOOLEAN
IF TopOfStack = Max THEN
RETURN TRUE
ELSE
RETURN FALSE
ENDIF
ENDFUNCTION
An algorithm AddInteger is required to add a new integer data element to a stack.
The stack is implemented as an array ArrayStack.
The function AddInteger() calls StackFull() and returns an appropriate message.
Complete the pseudocode for the function AddInteger().
FUNCTION AddInteger (NewInteger: INTEGER) RETURNS STRING

Complete this pseudocode binary search algorithm. Lower ← 0 $Mid \leftarrow 0$ Exit ← FALSE OUTPUT "Enter the name to be found " INPUT Target REPEAT THEN OUTPUT Target, " does not exist" Exit ← TRUE ENDIF Mid ← Lower + (Upper - Lower + 1) DIV 2 IF Names[Mid] < Target THEN</pre> Lower ← ENDIF IF Names[Mid] > Target THEN ENDIF THEN OUTPUT Target, " was found at location ", Mid Exit ← TRUE ENDIF [6] (b) Big O notation is used to classify efficiency of algorithms. The Big O notation for time complexity in a binary search is O(log n). (i) State the Big O notation for time complexity of a linear search.[1] (ii) Describe the meaning of O(log n) as it applies to a binary search algorithm.

12 (a) The array Names [0:99] is in alphabetical order.