



Cambridge International AS & A Level

COMPUTER SCIENCE

9618/04

Paper 4 Practical

For examination from 2021

SPECIMEN PAPER

2 hours 30 minutes



You will need: Candidate source files (listed on page 2)
evidence.doc

INSTRUCTIONS

- Carry out every instruction in each task.
- Save your work using the file names given in the task as and when instructed.
- You must **not** have access to either the internet or any email system during this examination.
- You must save your work in the evidence document as stated in the tasks. If your work is not saved in the evidence document, you will **not** receive marks for that task.
- You must use a high-level programming language from this list:
 - Java (console mode)
 - Python (console mode)
 - Visual Basic (console mode)
- A mark of **zero** will be awarded if a programming language other than those listed here is used.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **10** pages. Blank pages are indicated.

Candidate source files are used to answer question 3. The files are: **DataToAdd.txt** and **SecondData.txt**.

1 A 1-dimensional array, `TheData`, stores the following data:

20	3	4	8	12	99	4	26	4
----	---	---	---	----	----	---	----	---

(a) Write a program to declare the array as a local variable, and initialise the values with the data given. Give the array the identifier `TheData`.

Save your program as **question1**.

Copy and paste the program code into the **evidence.doc**

[2]

(b) Pseudocode for an insertion sort is shown below with **three** pieces of code missing.

```

PROCEDURE InsertionSort(TheData())
  FOR Count ← FirstElement TO .....
    DataToInsert ← TheData(i)
    Inserted ← 0
    NextValue ← Count - 1
    WHILE (NextValue >= 0 AND ..... <> 1)
      IF (DataToInsert < TheData(NextValue)) THEN
        TheData(NextValue + 1) ← TheData(NextValue)
        NextValue ← NextValue - 1
        TheData(NextValue + 1) ← .....
      ELSE
        Inserted ← 1
      ENDIF
    ENDWHILE
  NEXT
ENDPROCEDURE

```

In the program you wrote for **part 1(a)**, write the procedure `InsertionSort` to perform an insertion sort on the data in `TheData`. Pass the array you declared in **part 1(a)** by reference. Follow the pseudocode given and insert the missing pieces of code in your program.

Save your program.

Copy and paste the program code into the **evidence.doc**

[7]

(c) Write a procedure to output all the contents of the array `TheData` to the screen. The procedure should use iteration. Pass the array into the procedure as a parameter.

Save your program.

Copy and paste the program code into the **evidence.doc**

[3]

- (d) (i) The main program needs to output the data before the data has been sorted, and after the data has been sorted.

Use the subroutines you declared in **part (b)** and **part (c)**.

Edit the main program so it:

- outputs all the data in `TheData` before sorting
- sorts the data in `TheData`
- outputs the data after sorting
- outputs appropriate headings to identify the outputs before and after sorting.

Save your program.

Copy and paste the program code into the **evidence.doc**

[3]

- (ii) Test your program and take a screenshot to show the result.

Save your program.

Copy and paste the screenshots into the **evidence.doc**

[2]

- (e) (i) Write a function that:

- takes a whole number as input from the user
- if the number is in `TheData` outputs 'found' and returns true
- if the number is not in `TheData` outputs 'not found' and returns false.

Save your program.

Copy and paste the program code into the **evidence.doc**

[6]

- (ii) Test the function using the number 8 as input, then the number 9 as input.

Take a screenshot of the results of each test, making sure the input is visible in the screenshot.

Save your program.

Copy and paste the screenshots into the **evidence.doc**

[2]

- 2 'Hidden Boxes' is a game where players hide boxes in a virtual world. Other players search for the boxes. Object-oriented techniques must be used to program the game.

The program has a class named `HiddenBox`.

The class has the following properties:

Property	Description
<code>BoxName</code>	The name of the box, entered by the creator of the box e.g. <code>blueBox1</code>
<code>Creator</code>	The player name of the creator of the box e.g. <code>girl125</code>
<code>DateHidden</code>	The date the box was created e.g. <code>01/01/2019</code>
<code>GameLocation</code>	The location of the box, in the format two letters followed by four numbers e.g. <code>LL4561</code> <code>YE4561</code>
<code>LastFinds</code>	A two-dimensional array that stores the player name of the last ten players to find the box, and a comment that each player leaves about the box
<code>Active</code>	A Boolean value, <code>True</code> means the box can be found (active), <code>False</code> means the box cannot be found (inactive)

- (a) Write the program code for the class, `HiddenBox`. Declare the properties as private.

Do **not** write the constructor or any other methods.

If you are using Python, add a comment for each property to give its identifier and data type.

Save your program as **question2**

Copy and paste the program code into the **evidence.doc**

[4]

- (b) The constructor:

- takes the box name, creator, date hidden and game location as parameters
- sets the box to be inactive
- initialises all the array elements as empty.

Edit your program from **part 2(a)** and write the constructor for `HiddenBox`.

Do **not** write any of the other methods.

Save your program.

Copy and paste the program code into the **evidence.doc**

[4]

- (c) The class `HiddenBox` has two getter methods: `GetBoxName` and `GetGameLocation`.

Edit your program and write the getter methods `GetBoxName` and `GetGameLocation` in the class `HiddenBox`.

Save your program.

Copy and paste the program code into the **evidence.doc**

[3]

- (d) (i) The main program declares a 1D array named `TheBoxes` of type `HiddenBox`.

The main program can store up to 10 000 elements as a local variable.

Write program code for the main program.

Save your program.

Copy and paste the program code into the **evidence.doc**

[2]

- (ii) The procedure `NewBox`:

- takes the Name, Creator, Date Hidden and Game Location of the box as input
- creates an instance of `HiddenBox` and appends it to the end of `TheBoxes`

Write program code for the procedure, `NewBox`.

Save your program.

Copy and paste the program code into the **evidence.doc**

[4]

- (iii) After declaring the array, the main program calls `NewBox`.

Edit the main program to call `NewBox`.

Save your program.

Copy and paste the program code into the **evidence.doc**

[1]

(e) A new type of box is created. The new type of box is a puzzle box.

The class `PuzzleBox`, inherits from `HiddenBox`.

`PuzzleBox` has the additional properties:

- `PuzzleText` as `String`
- `Solution` as `String`

The constructor for `PuzzleBox` extends the constructor from `HiddenBox` to also take the values for `PuzzleText` and `Solution`.

Write program code for the class, `PuzzleBox`.

If you are using Python, add a comment for each property to give its identifier and data type.

Save your program.

Copy and paste the program code into the **evidence.doc**

[3]

3 `QueueData` is a queue that stores up to 20 string values. The queue has a start pointer to identify the first element in the queue, and an end pointer to identify that last element in the queue.

(a) Write a program that defines `QueueData` and its pointers.

Save your program as **program 3**.

Copy and paste the program code into the **evidence.doc**

[3]

(b) Write program code for a function, `Enqueue`.

The function should take an item to be added to the queue as a parameter:

- if the element was successfully added to the queue, the function should return `TRUE`
- if the queue was full and the item could not be added to the queue the function should return `FALSE`
- each time an item is successfully added, the function should update the pointers.

Save your program.

Copy and paste the program code into the **evidence.doc**

[6]

(c) Write program code for a function, `ReadFile`, which:

- asks the user to input a filename
- reads the data from the text file into `QueueData`.

The function returns the following values when:

- all of the data is successfully read into the queue, the function returns the value 2
- the queue is full and not all the data could be inserted into the queue, the function returns the value 1
- the text file could not be found, the function returns the value -1.

Save your program.

Copy and paste the program code into the **evidence.doc**

[8]

(d) (i) The main program calls `ReadFile`.

`ReadFile` outputs an appropriate message to identify if:

- the text file could not be found
- the queue was full
- all items were added to the queue.

Edit the main program to call `ReadFile` and output the appropriate message.

Save your program.

Copy and paste the program code into the **evidence.doc**

[4]

(ii) You have **two** text files `DataToAdd.txt` and `SecondData.txt`.

Use the filenames below as input to test your program:

- `DataToAdd.txt`
- `SecondData.txt`
- `ThirdData.txt` (this file does not need to be created)

Take a screenshot to show the result from each test. Make sure you show the name of the text file being input in your screenshots.

Save your program.

Copy and paste the **three** screenshots into the **evidence.doc**

[3]

(e) The function, `Remove`:

- removes the first two elements from the queue
- concatenates the elements with a space in between them.
For example, if the first item in the queue is "Hello" and the second is "World", the function creates "Hello World"
- returns the concatenated string
- returns "No Items" if there are insufficient items in the queue.

Write program code for the function `Remove`.

Save your program.

Copy and paste the program code into the **evidence.doc**

[5]

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