MODULE L STANDARD ALGORITHMS · L1

Linear search

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 7.4, 7.7, 7.9

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**. Write all algorithms in pseudocode. The first element of every array on this sheet is at index 1. All data on this sheet is made up.

1

Total: 4 marks

(a) Describe how a linear search is used to find a value in a 1D array. **[3]**

(b) A linear search is carried out on an array of 40 elements. The value being searched for is **not** in the array. State how many elements are checked. **[1]**

2

Total: 3 marks

A bakery stores the batch numbers of today's loaves in the array `Batch[1:8]`.

Index	1	2	3	4	5	6	7	8
Batch	507	213	880	145	213	692	330	471

(a) A linear search that stops when the value is found is used to look for the batch number 145. State, in order, every value in `Batch` that is compared with 145. **[2]**

(b) State the index of the element where 145 is found. **[1]**

3

Total: 5 marks

A wildlife centre puts a numbered tag on each animal. The array `Tag[1:6]` holds these values:

Index	1	2	3	4	5	6
Tag	31	18	44	18	27	52

This algorithm searches `Tag` for a value that is input.

```
01 Position ← 0
02 Index ← 1
03 INPUT Target
04 REPEAT
05     IF Tag[Index] = Target
06       THEN
07         Position ← Index
08     ENDIF
09     Index ← Index + 1
10 UNTIL Position <> 0 OR Index > 6
11 IF Position = 0
12   THEN
13     OUTPUT "Not found"
14   ELSE
15     OUTPUT "Found at ", Position
16 ENDIF
```

(a) Complete the trace table for the algorithm using the input data: **27** **[3]**

Index	**Position**	**OUTPUT**

(b) State the output when the input is **60** **[1]**

(c) State how many times line 05 is executed when the input is **60** **[1]**

4 **Total: 6 marks**

A builders' merchant stores the codes of 200 products in the 1D array `Code[1:200]` and the price of each product in the 1D array `Price[1:200]`. The price of the product in `Code[1]` is in `Price[1]`, and so on.

(a) Write an algorithm using pseudocode to: **[6]**

- input a product code
- use a linear search to look for the product code in `Code`
- stop searching as soon as the product code is found
- output the price of the product if the code is found
- output a suitable message if the code is not found.

You do not need to declare the arrays.

5 **Total: 3 marks**

The algorithm in Question 3 only finds the **first** element of `Tag` that matches `Target`.

(a) Explain how the algorithm in Question 3 could be changed so that it outputs the index of **every** element that matches `Target`, and still outputs "Not found" if there is no match. Any code you use must be fully explained. **[3]**

Total for this worksheet: 21 marks