MODULE M PROGRAMMING · M19

Two-dimensional arrays and looping through them

Original practice questions · 21 marks · ~25 minutes · OCR J277 spec 2.2.3

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**. Code is written in OCR Exam Reference Language, where arrays are indexed from 0. All data on this sheet is made up.

1

Total: 3 marks

(a) Tick (✓) **one** box in each row to show whether each statement about 2D arrays is true or false. **[3]**

Statement	True	False
Every element in a 2D array must be of the same data type.		
After `array grid[4,6]`, the element `grid[4,6]` can be used to store a value.		
Extra rows can be added to an array while the program is running.		

2 **Total: 5 marks**

A sports centre stores details of its instructors in a 2D array with the identifier `instructors`. The array is used like a database table: each row is one record and each column is one field. Every element is a string. The first index is the row and the second index is the column, so `instructors[0,1]` is `"Okafor"`.

	0 (ID)	1 (Surname)	2 (Activity)	3 (Years)
0	"I01"	"Okafor"	"Swimming"	"12"
1	"I02"	"Lindqvist"	"Climbing"	"3"
2	"I03"	"Haddad"	"Yoga"	"7"
3	"I04"	"Moreau"	"Climbing"	"15"
4	"I05"	"Tanaka"	"Swimming"	"1"

(a) State the value stored in `instructors[2,1]` **[1]**

(b) Instructor `"I05"` now teaches Yoga instead of Swimming. Write **one** line of code to store this change in the array. **[1]**

(c) Write code that uses iteration to output the surname of every instructor whose activity is `"Climbing"`. **[3]**
You must use either:

- OCR Exam Reference Language, or
- a high-level programming language that you have studied.

3

Total: 7 marks

A plant nursery has three growing beds. A sensor in each bed takes four soil moisture readings a day. The readings are stored in the 2D array `moisture`. The first index is the bed (0 to 2) and the second index is the reading (0 to 3), so `moisture[0,3]` is `31`.

	Reading 0	Reading 1	Reading 2	Reading 3
Bed 0	42	38	27	31
Bed 1	55	49	44	29
Bed 2	33	26	35	40

(a) State the output when this code is run. **[1]**

```
01 total = 0
02 for reading = 0 to 3
03     total = total + moisture[1, reading]
04 next reading
05 print(total)
```

(b) State the output when this code is run. Write each output on a new line. **[3]**

```
01 for bed = 0 to 2
02     for reading = 0 to 3
03         if moisture[bed, reading] < 30 then
04             print(str(bed) + " " + str(reading))
05         endif
06     next reading
07 next bed
```

(c) Write code that uses iteration to calculate and output the average of reading 3 (the last reading of the day) for the three beds. **[3]**

You must use either:

- OCR Exam Reference Language, or
- a high-level programming language that you have studied.

4 **Total: 6 marks**

A self-storage company has 40 lockers in 5 rows of 8. The 2D array `rented` stores whether each locker is rented. The first index is the row (0 to 4) and the second index is the locker in that row (0 to 7). Each element is `True` if the locker is rented and `False` if it is free.

(a) Write a program that: **[6]**

- uses nested loops to check every locker in the array
- counts how many lockers are free
- outputs the number of free lockers
- also outputs `All lockers rented` if no lockers are free.

You must use either:

- OCR Exam Reference Language, or
- a high-level programming language that you have studied.

Total for this worksheet: 21 marks