MODULE M PROGRAMMING · M14

Nested selection and nested loops

Original practice questions · 22 marks · ~25 minutes · Cambridge 0478 syllabus 8.1.5, 8.2, 7.7, 7.8, 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 **22 marks**. Write all algorithms in pseudocode. All data on this sheet is made up.

1

Total: 3 marks

Here are three pseudocode algorithms.

Algorithm P

```
IF Stock < 5
  THEN
    OUTPUT "Reorder"
ENDIF
IF Stock = 0
  THEN
    OUTPUT "Sold out"
ENDIF
```

Algorithm Q

```
IF Speed > 50
  THEN
    IF Lane = 1
      THEN
        OUTPUT "Move over"
    ENDIF
ENDIF
```

Algorithm R

```
FOR Week ← 1 TO 4
    FOR Day ← 1 TO 7
        OUTPUT Week * Day
    NEXT Day
NEXT Week
```

(a) Tick (✓) **one** box in each row to show what each algorithm contains. **[3]**

Algorithm	Nested selection	Nested iteration	No nesting
P			
Q			
R			

2

Total: 4 marks

A delivery firm stores the number of parcels each of its 2 vans delivered on each of 3 days in the 2D array `Parcels[1:2, 1:3]`. `Parcels[Row, Col]` is the number for van `Row` on day `Col`.

	Col 1	**Col 2**	**Col 3**
Row 1	12	4	15
Row 2	9	11	8

```
01 FOR Row ← 1 TO 2
02     Count ← 0
03     FOR Col ← 1 TO 3
04         IF Parcels[Row, Col] > 10
05           THEN
06             Count ← Count + 1
07         ENDIF
08     NEXT Col
09     OUTPUT Count
10 NEXT Row
```

(a) Complete the trace table for the algorithm using the data in the array `Parcels`. You may not need to use all the rows. **[4]**

Row	**Col**	**Count**	**OUTPUT**

3

Total: 4 marks

A meeting-room heater uses this algorithm. `Temp` is the room temperature in °C and `People` is the number of people in the room.

```
01 INPUT Temp
02 INPUT People
03 IF Temp < 18
04   THEN
05     IF People > 0
06       THEN
07         OUTPUT "Heating on"
08       ELSE
09         OUTPUT "Low heat"
10     ENDIF
11   ELSE
12     OUTPUT "Heating off"
13 ENDIF
```

(a) Complete the table to show the output for each set of input data. **[3]**

Temp	People	OUTPUT
15	3	
15	0	
18	2	

(b) State why line 05 is **not** executed when `Temp` is 21. **[1]**

4 **Total: 5 marks**

A hotel has 5 floors, numbered 1 to 5, with 12 rooms on each floor, numbered 1 to 12. The 2D array `Cleaned[1:5, 1:12]` of type BOOLEAN stores TRUE if a room has been cleaned and FALSE if it has not.

This algorithm should output, for each floor, the number of rooms that have **not** been cleaned. The algorithm contains **two** errors.

```
01 FOR Floor ← 1 TO 5
02     NotDone ← 0
03     FOR Room ← 1 TO 12
04         IF Cleaned[Floor, Room] = FALSE
05           THEN
06             NotDone ← NotDone - 1
07         ENDIF
08     NEXT Floor
09     OUTPUT "Floor ", Floor, " rooms left: ", NotDone
10 NEXT Floor
```

(a) Identify the line numbers of the **two** errors and suggest a correction for each error. **[4]**

Error 1 Line number ..... Correction

Error 2 Line number ..... Correction

(b) The errors have been corrected. State how many times line 04 is executed when the algorithm is run once. **[1]**

5 **Total: 6 marks**

A weather station records the rainfall for each day of one week, as a whole number of millimetres (mm).

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

- input a rainfall reading for each of the 7 days, using a loop
- inside that loop, validate each reading so that only readings from 0 to 200 are accepted, and input the reading again until it is valid
- count how many days had more than 25 mm of rainfall
- output this count, with a suitable message, after all 7 readings have been input.

You do not need to declare any variables.

Total for this worksheet: 22 marks