# Homework 4: Testing Answers

1. An algorithm has been written to calculate the average of a set of numbers entered by the user. Each data item should be an integer value between 0 and 100.

(i) List **five** data items that you would use to test the routine, stating in each case the purpose of the test. [5]

 0,100, (boundary values)

 Anything between 1 and 99, e.g 34, (normal value)

 -1, 101 (erroneous values)

(ii) Do these tests comprehensively test the algorithm? If not, suggest an additional test that would test some previously untested aspect of the program, explaining what this is. [2]

 It only tests integer values. Could test with a non-numeric character such as *n*, or *a* number with a decimal point such as 78.5.

2. The following algorithm counts the number of gaps in a piece of text held in an array ***sentence***. A gap is defined as one or more spaces. For example, (represent a space with a dot • for clarity), the sentence “I•am•••late•for••class” has four gaps.

 Assume that sentence [i] is the *i*th character of the sentence

 gapcount = 0

 previousCharSpace = FALSE

 FOR i = 1 to len(sentence)

 IF sentence[i] = “ ” THEN

 IF previousCharSpace = FALSE THEN

 gapcount = gapcount + 1

 ENDIF

 previousCharSpace = TRUE

 ELSE

 previousCharSpace = FALSE

 ENDIF

 ENDFOR

 OUTPUT gapcount

 If the array ***sentence*** contains the characters “Good••to•go” (where the dots are used here for clarity to represent spaces, but will be held as spaces in the array) complete a trace table showing the contents of each variable as it changes. The column headings and the first line of the trace table are given below. [5]

|  |  |  |  |
| --- | --- | --- | --- |
| **i** | **sentence.char(i)** | **gapcount** | **previousCharSpace** |
| **1** | **G** | **0** | **FALSE** |
| 2 | o |  |  |
| 3 | o |  |  |
| 4 | d |  |  |
| 5 | space | 1 | TRUE |
| 6 | space |  |  |
| 7 | t |  | FALSE |
| 8 | o |  |  |
| 9 | space | 2 | TRUE |
| 10 | g |  | FALSE |
| 11 | o |  |  |

 3. The following algorithm is intended to determine whether an element is in a solid, liquid or gaseous state. Temperatures are accurate only to the nearest integer.

 OUTPUT “Please enter temperature in celsius”

 temperature = int (USERINPUT)

 IF temperature >= -273 and temperature <= -7

 OUTPUT “Solid”

 ELSE

 IF temperature > -6 and temperature < 59

 OUTPUT “Liquid”

 ELSE

 IF Temperature >= 59

 OUTPUT “Gas”

 ELSE

 OUTPUT “Not found”

 (i) Complete the following test plan, adding 4 more useful tests. [6]

 (ii) Which of the tests gives an unexpected result? [1]

 (iii) Correct the line in the algorithm which contains a logic error. [1]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test** | **Test data** | **Reason for test** | **Expected result** | **Actual result** |
| 1 | -7 | Boundary data | Solid | Solid |
| 2 | -6 | Boundary data | Liquid | Not found |
| 3 | 30 | Normal data between -6 and 59 | Liquid | Liquid |
| 4 | 59 | Boundary data | Gas |  |
| 5 | -273 | Boundary data | Solid |  |
| 6 | -274 | Invalid data | Not found |  |
| 7 | 80 | Normal data >59 | Gas |  |

 [Total 20 marks]

Test 2 gives an unexpected result.

The line

 IF temperature > -6 and temperature < 59

is incorrect, the condition should be

 IF temperature >= -6 and temperature < 59 *(or >-7)*

**See Python program Homework qu 3 solid liquid gas.py**

**Trivia!** For all the chemistry students in your class wondering which element this is, the answer is Bromine. It’s actual melting point is -7.2 and boiling point is 58.8. It is a reddish brown liquid at room temperature and is used in the photographic and petrochemical industries.