



Worksheet 2

Question 1

Here is an algorithm

```

count ← 4
number ← 0

WHILE (count ≠ 0)
    number ← count * count
    output number
    count ← count - 1
ENDWHILE
    
```

Complete the trace table to determine the purpose of this algorithm

count	number	Output

[5 marks]

b) State the purpose of this algorithm

[1 mark]

Question 2

An algorithm has been designed to validate separate parts of a code. The user enters the first part of the code, two characters, and the second part of the code, four digits. The algorithm calculates a score reflecting the validity of the parts.

Here is the algorithm.

```
score = 0
code1 = ""
code2 = ""

code1 ← USERINPUT
code2 ← USERINPUT

IF ( code1[0] >= 'A' AND code1[0] <= 'Z' ) THEN
    score ← score + 1
ENDIF

IF ( code1[1] >= 'A' AND code1[1] <= 'Z' ) THEN
    score ← score + 1
ENDIF

IF (code2 >= 1111) THEN
    score ← score + 1
ENDIF

IF (code2 <= 9999 ) THEN
    score ← score + 1
ENDIF

IF (score != 4) THEN
    OUTPUT "Invalid input", score
ELSE
    OUTPUT "Valid input", score
ENDIF
```

The expected behaviour for a given input is shown in this table.

Case	Character string	Number	Output
1	WB	1234	Valid input 4
2	12	1234	Invalid input 2.
3	WB	876543	Invalid input 3
4	wb	4	InvalidInput 1

Use trace tables to demonstrate that the algorithm generates the predicted output when supplied with the given input.

Hint: You can indicate an empty string using a hyphen symbol, double quotes or <empty>.

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Case 1

Code1	Code2	Score	Output

Case 2

Code1	Code2	Score	Output

Case 3

Code1	Code2	Score	Output

Case 4

Code1	Code2	Score	Output

[2 marks]

Question 3

Here is an algorithm to sum the numbers in a one-dimensional data structure. It has an error.

```
numTable ← [9, 8, 7, 6, 5]
index ← 0
length ← 0
total ← 0

length ← LEN(numTable) - 1

WHILE (index < length)
    total ← total + numTable[index]
    index ← index + 1
ENDWHILE

OUTPUT total
```

a) Complete the trace table to identify the error. You may not need all the rows.

length	index	numTable[index]	total	output

State the error

Give the correct code

Question 4

Write a program for the pseudocode that asks the user to enter their password. The program should keep asking the user until the correct password is entered. Assume we have a variable called **password** that stores the **"computer"** as the password.

[5 marks]

Question 5

Write the pseudo-code for a program that asks the user to enter two numbers. The program should then display the following message:

“What would you like to do?”

- 1) Addition**
- 2) Subtraction**
- 3) Multiplication**

The program should then carry out the chosen operation and print the result.

[7 marks]



Question 6

The following subroutine, called **largest**, is defined to take three parameters. Complete the subroutine so that it returns the largest of the three values.

```
SUBROUTINE largest(a, b, c)
  largest ← a
  _____
  _____
  _____
  _____
  _____
  _____
  _____
  _____
  RETURN largest
ENDSUBROUTINE
```

[5 marks]

Question 8

Consider the following code:

```
m ← False
n ← True
IF NOT (m OR n) THEN
  OUTPUT 'P'
  IF NOT((NOT m) AND (NOT n)) THEN
    OUTPUT 'Q'
  ELSE
    OUTPUT 'R'
  ENDIF
ELSE
  OUTPUT 'S'
  IF (NOT m) OR (NOT n) THEN
    OUTPUT 'T'
  ELSE
    OUTPUT 'U'
  ENDIF
ENDIF
```

State the output from the algorithm shown in the code above.

[2 marks]

Question 9

Develop an algorithm using pseudo-code that:

- Initialises a variable called **prodValid** to False
- Sets a variable called **prodValid** to True if the string contained in the variable **prod** is an uppercase **P** followed by the character representation of a single uppercase letter (A-Z).

Examples:

- if the value of **prod** is **PZ** or **PA**, then **prodValid** should be True
- If the value of **prod** is **pB** or **P7**, then **prodValid** should be False

You can use the subroutine **isUppercase(ch)** in your answer. The subroutine **isUppercase** returns True if the character parameter **ch** is an uppercase letter and False otherwise.

[3 marks]

Question 10

Develop an algorithm, using pseudo-code, that assists a hot chocolate vendor in a cold region in projecting how many cups of hot chocolate they will sell on a particular day. Your algorithm should:

- get the user to enter whether it is a holiday or a regular day
- get the user to enter the temperature forecast in degrees Celsius (they should enter a number between -10 and 20 inclusive; if the number falls outside of this range, then they should be made to re-enter another number until they enter a valid temperature)
- Determine the number of hot chocolates that are likely to sell based on the following:
 - 80 cups are likely to be sold if the temperature is between 10 and 20 degrees inclusive,
 - 100 cups are likely to be sold if the temperature is between 0 and 9 degrees inclusive,
 - 150 cups will likely be sold if the temperature falls below 0 degrees.
- increase the prediction by 50% if it is a holiday
- display the projected number of cups of hot chocolate that are likely to be sold.

[9 marks]