

# COMP 102B 2014, Assignment 2

## Due Wednesday October 15<sup>th</sup> 2014

### [20%] 1. Product of numbers

Write a JavaScript function `Prod()` that receives an arbitrary amount of numbers and returns their product. For example, if you type `show(Prod(2,3,4,5))`, you should receive 120 (which is  $2*3*4*5$ ). If no argument is given (`Prod()`), the output should be 1.

### 2. Min and Max

Consider the algorithm seen in class to find the location of the Minimum element:

[25%]

```
Procedure FindMin( $x_1x_2\dots x_n$ )  
mini:=1; min:= $x_1$   
  
for i:=2 to n do  
  
    if  $x_i < \text{min}$  then min:= $x_i$ ; mini:=i  
  
output mini
```

a) Argue that the comparison of elements in the **if** statement occurs  $n-1$  times in total.

- b) Rewrite this algorithm as **FindMax** so to find the location of the Maximum instead of the Min.
- c) Write a new algorithm that finds BOTH the Min and the Max using at most  $3n/2$  comparisons.

### 3. Mystery algorithm

Consider the following algorithm :

[15%]

```
Input  $T, x_1, x_2, \dots, x_n$   
 $T_i := 0$   
for  $i := 1$  to  $n$  do  
  
    if  $T = x_i$  then  $T_i := i$   
  
output  $T_i$ 
```

- a) Run this algorithm on inputs  $T=3, x_1=2, x_2=5, x_3=3$ , and provide a complete trace of execution.
- b) Describe in words, what this algorithm is doing.  
(clarify what happens when some  $x_i$ 's are identical)
- c) What is to be understood when the output is 0 ?

## **[20%]** 4. JAVAscript addition

Write a JAVAscript function **add** that inputs two strings **x,y** and output another string **z** such that if you consider the numerical value of the characters of **x** and similarly for **y** and **z**, we have the relation **z=x+y**.

Example:

```
add(  
"5000000000303030303030303030303000000000333333333333"  
, "5000000000303030303030303030303000000000333333333333"  
)
```

should output the string

```
z="100000000006060606060606060606060000000000666666666666"
```

which is the numerical sum of the values represented by **x** and **y**. Your function should work for arbitrarily long numbers. We don't care what happens if the inputs are not of the right format. A few examples will be made available to you. Your function should be executed on these inputs and return the correct output.

## **[20%]** 5. Multiplication

Write an algorithm to multiply two numbers (base 10) of **n** digits each and output a number of **2n** digits:

$$x_n x_{n-1} \dots x_1 * y_n y_{n-1} \dots y_1 = z_{2n} z_{2n-1} z_{2n-2} \dots z_1.$$