

CNAPS 10 10-6-09

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ANOTHER EXERCISE:

MODIFY SEQUENTIAL SO AS TO:

- Return All occurrences of target
- Return rightmost occurrence of target
- Count # of occurrences of target
- Return 2<sup>nd</sup>, 3<sup>rd</sup>, ..., or  $j^{\text{th}}$  occurrence of target.

Problem: find largest / or smallest  
# in a list of #s.

INPUT:  $n \geq 1$  (# of #s in list)  
 $a_1, \dots, a_n$  (the list itself)

Output: The largest value in  
the list, and its position in  
the list.

Assume: list elements are  
all distinct, i.e. no repeats.

# FindLargest

- 1.)  $\text{max} \leftarrow a_1$
- 2.)  $j \leftarrow 1$
- 3.)  $i \leftarrow 2$
- 4.) while  $i \leq n$
- 5.)  $\left[ \begin{array}{l} \text{if } a_i > \text{max} \\ \text{max} \leftarrow a_i \\ j \leftarrow i \\ i \leftarrow i+1 \end{array} \right.$
- 6.)
- 7.)
- 8.)
- 9.) Print  $\text{max}, j$
- 10.) stop

Ex. Tower ON :

$n=7$

$a_1$	$a_2$	$a_3$	$a_4$	$a_5$	$a_6$	$a_7$
2	1	-7	5	3	11	0

<u>max</u>	<u>j</u>	<u>i</u>
2	+	2
<del>8</del>	4	3
11	6	4
		<del>5</del>
		6
		7
		8

OUTPUT : 11 6

# A variation of Find Largest

- 1.)  $j \leftarrow 1$
- 2.)  $i \leftarrow 2$   $\longleftarrow$  Initialize LCV
- 3.) while  $i \leq n$   $\longleftarrow$  TEST LRC
- 4.)  $\left[ \begin{array}{l} \text{if } a_i > a_j \\ \cdot \end{array} \right.$
- 5.)  $\left[ \begin{array}{l} j \leftarrow i \end{array} \right.$
- 6.)  $\left[ \begin{array}{l} i \leftarrow i + 1 \end{array} \right.$   $\longleftarrow$  Increment LCV
- 7.) Print  $a_j, j$
- 8.) Stop

Same thing with a for loop  
instead of while

1.)  $j \leftarrow 1$

2.) for  $i \leftarrow 2$  to  $n$

3.)  $\left[ \begin{array}{l} \text{if } a_i > a_j \end{array} \right.$

4.)  $\left[ \begin{array}{l} j \leftarrow i \end{array} \right.$

5.) print  $a_j, j$

6.) stop

Problem: Assume Addition  
is a Primitive OP, but multi-  
-plication is not.

Input: Two integers  $a, b$   
(NON-NEGATIVE)

Output:  $a \cdot b$

obviously ~~the~~ following is invalid

- 1.) get  $a, b$
- 2.) Print  $a \cdot b$
- 3.) stop

This ONE works!

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- 1.) get  $a, b$
- 2.)  $product \leftarrow 0$
- 3.)  $i \leftarrow 1$
- 4.) while  $i \leq b$
- 5.)  $product \leftarrow product + a$
- 6.)  $i \leftarrow i + 1$
- 7.) Print  $product$
- 8.) stop

or as a for loop:

- 1.) get  $a, b$
- 2.)  $p \leftarrow 0$
- 3.) for  $i \leftarrow 1$  to  $b$
- 4.)  $[ p \leftarrow p + a$
- 5.) Print  $p$
- 6.) stop

Trace:  $a = 2, b = 3$

<u>Product</u>	<u>i</u>
0	1
2	2
4	3
6	4

Print 6