**CIS 360 Lab #3: Design Algorithm using ADTs and Analyze Running Time**

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**Pseudo Code Standard and Examples**

* A combination of good English and good coding conventions
* Use program control keywords such as: for/while/do loop, if, switch, return.
* Use meaning names for variables and methods.
* Ignore unnecessary details and independent of program language.

*A pseudocode standard* : <http://users.csc.calpoly.edu/~jdalbey/SWE/pdl_std.html>

**Task A:** Given an array, A, containing n numbers in order. Describe in pseudocode an efficient algorithm for reversing the order of the numbers in A using a single for-loop that indexes through the cells of A, to insert each element into a **stack**, and then another for-loop that removes the elements from the **stack** and puts them back into A in reverse order.

Task\_A(array A):

n = length of A

initialize stack

for i from 1 to n:

append A[i] to stack

for i from 1 to n:

A[i] = stack’s top value

return A

What is the running time of this algorithm? \_\_\_\_\_\_2n\_\_\_\_\_\_\_\_

**Task B:** Given an array, A, containing n numbers in order. Describe in pseudocode an efficient algorithm for reversing the order of the numbers in A using a single for-loop that indexes through the cells of A, to insert each element into a **queue**, and then another for-loop that removes the elements from the **queue** and puts them back into A in reverse order.

Task\_B(Array A):

n = length of A

initialize queue

for i from 1 to n:

append A[i] to queue

for i from n to 1, go down by -1:

A[i] = dequeue from queue

return A

What is the running time of this algorithm? \_\_\_\_\_\_ 2n\_\_\_\_\_\_\_\_\_

**Task C:** Given an array, A, containing n numbers in order. Describe in pseudocode an efficient algorithm for reversing the order of the numbers in A using a single for-loop that exchanges element at index i and element at index (n-i) using a temporary variable.

Task\_C(array A):

n = length of A

for i from 1 to half the length of A:

temp = A[i]

A[i] = A[n-i]

A[n-i] = temp

return A

What is the running time of this algorithm? \_\_\_\_\_\_n\_\_\_\_\_\_\_\_\_\_

Java Stack API <https://docs.oracle.com/javase/7/docs/api/java/util/Stack.html>

Java Queue usage example: <https://www.educba.com/queue-in-java/>

**Task D.1** Implement the pseudo code in Task A and show the testing result with an array of size 5.

**Input: [1,2,3,4,5]**

**Output: [5, 4, 3, 2, 1]**

**Task D.2** Implement the pseudo code in Task B and show the testing result with an array of size 6.

**Input: [1,2,3,4,5,6]**

**Output: [6, 5, 4, 3, 2, 1]**

**Task D.3** Implement the pseudo code in Task C and show the testing result with an array of size 5 and an array of size 6.

**Input 1 (array of size 5): [1,2,3,4,5]**

**Output 1: [5, 4, 3, 2, 1]**

**Input 2 (array of size 6): [1,2,3,4,5,6]**

**Output 2: [6, 5, 4, 3, 2, 1]**