California State University, Monterey Bay

Week 2 – Programming Assignment Stacks

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CST370

Design and Analysis of Algorithms

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Exercise (a) Algorithm

OVERVIEW:

This algorithm is for the design for sorting a group of numbers in ascending order using two stacks. It is assumed that the numbers are initially given in one of the stacks, and that the stack data structure methods are available (i.e., push, pop, top, and empty).

The process involves putting the numbers in the Stack 1 in Descending order on Stack 2, and then putting them back onto Stack 1 in Ascending order (simple pop to push). This is done using a helper variable (Current Number). Current Number holds the current Stack 1 value that is compared to the numbers on Stack 2. If the numbers are greater than the Current Number then move them back to Stack 1. Otherwise just put the Current Number onto Stack 2. This is repeated until Stack 1 is empty. After which, Stack 2 is copied back to Stack 1 to create an Ascending order.

Note: The term "Remove" is used for a TOP followed by a POP

PSUDOCODE

Create a variable called CurrentNumber;

While Stack 1 is not empty do

    Remove Top value in Stack 1 into CurrentNumber

    While Stack 2 is not empty and the Top value > CurrentNumber

        Remove Stack 2 Top and push it on Stack 1

    End of 2nd While

    Push CurrentNumber on to Stack 2

End of 1st While

While Stack 2 is not empty do

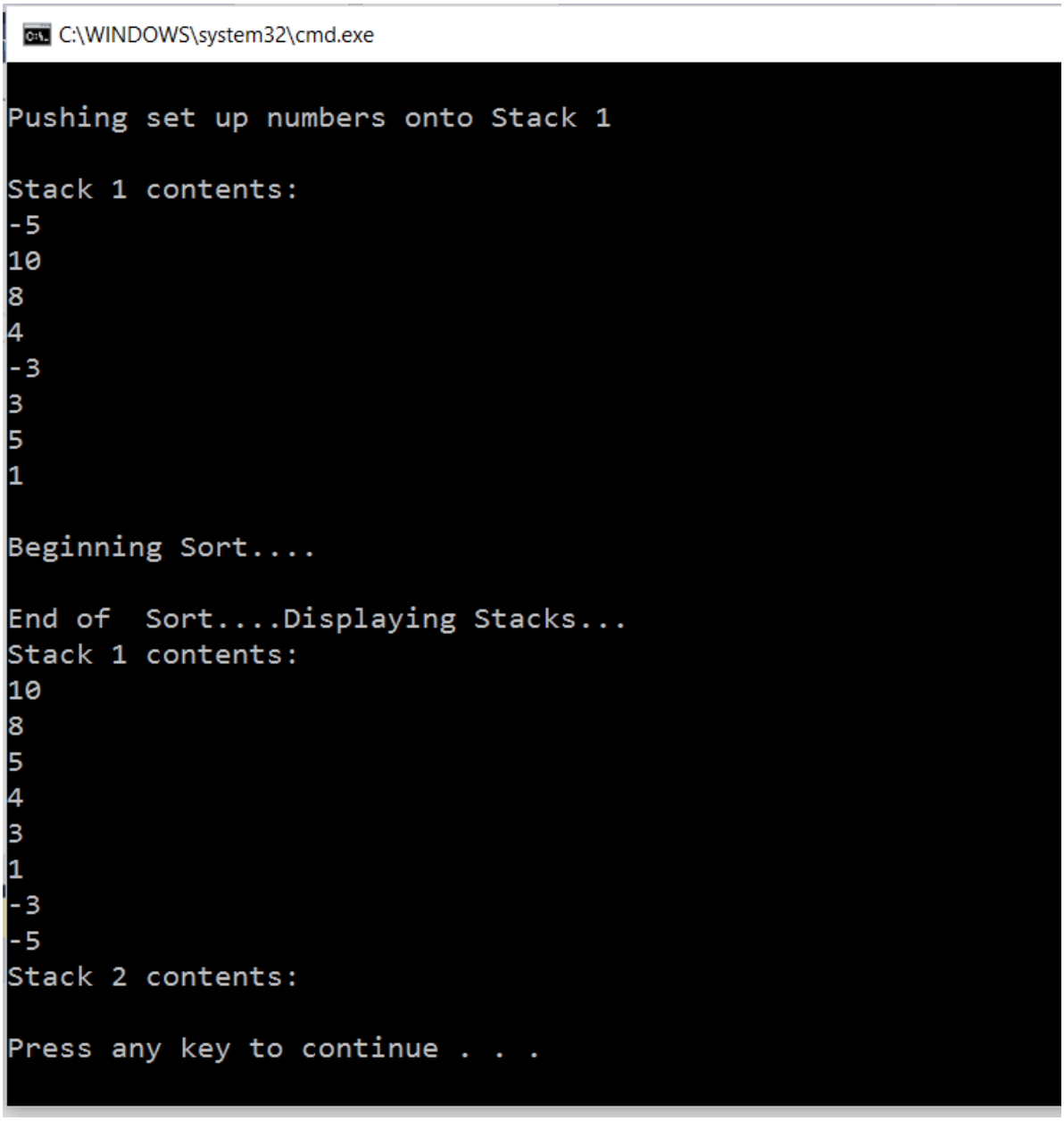
    Remove Top value in Stack 2 and push it on Stack 1

End of While

Display Stack 1

Exercise (b) Screen Shots

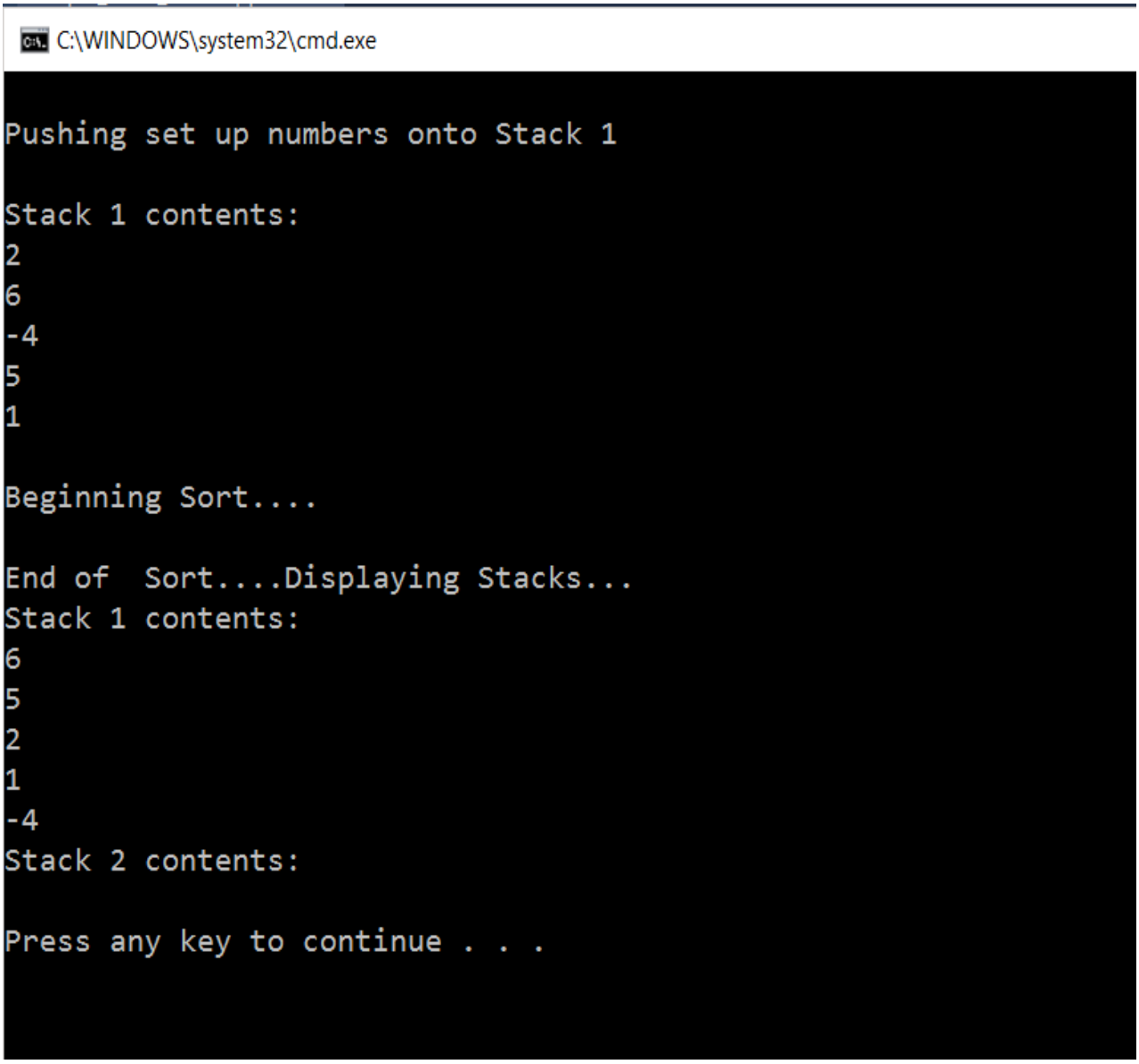
Test Run 1



Explanation:

A run was made using the numbers **1, 5, 3, -3, 4, 8, 10 -5**
which resulted sorted values of **10, 8, 5, 4, 3, 1, -3, -5**.

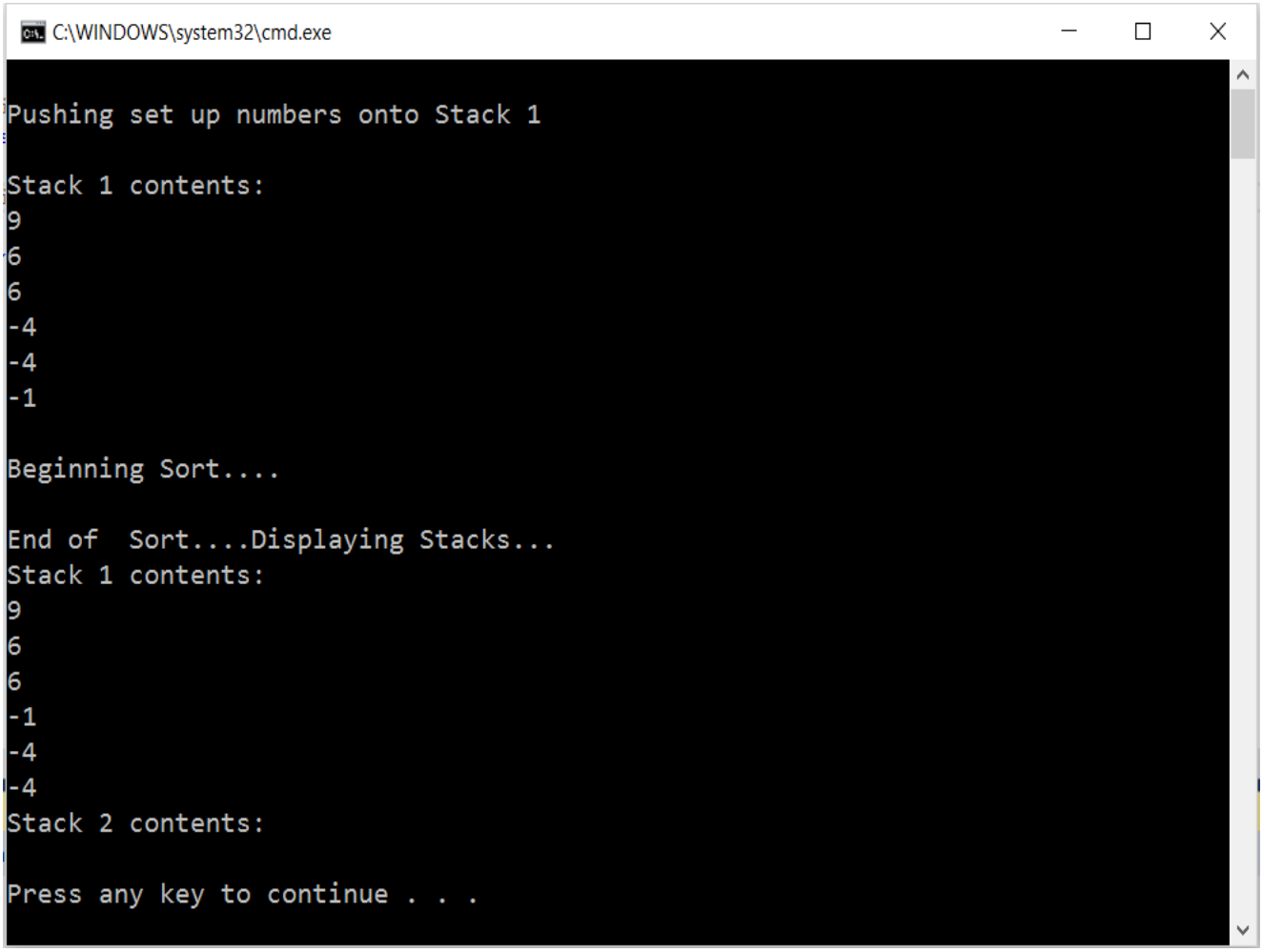
Test Run 2



Explanation

A run was made using the numbers **1, 5, -4, 6, 2**
which resulted sorted values of **6, 5, 2, 1, -4**.

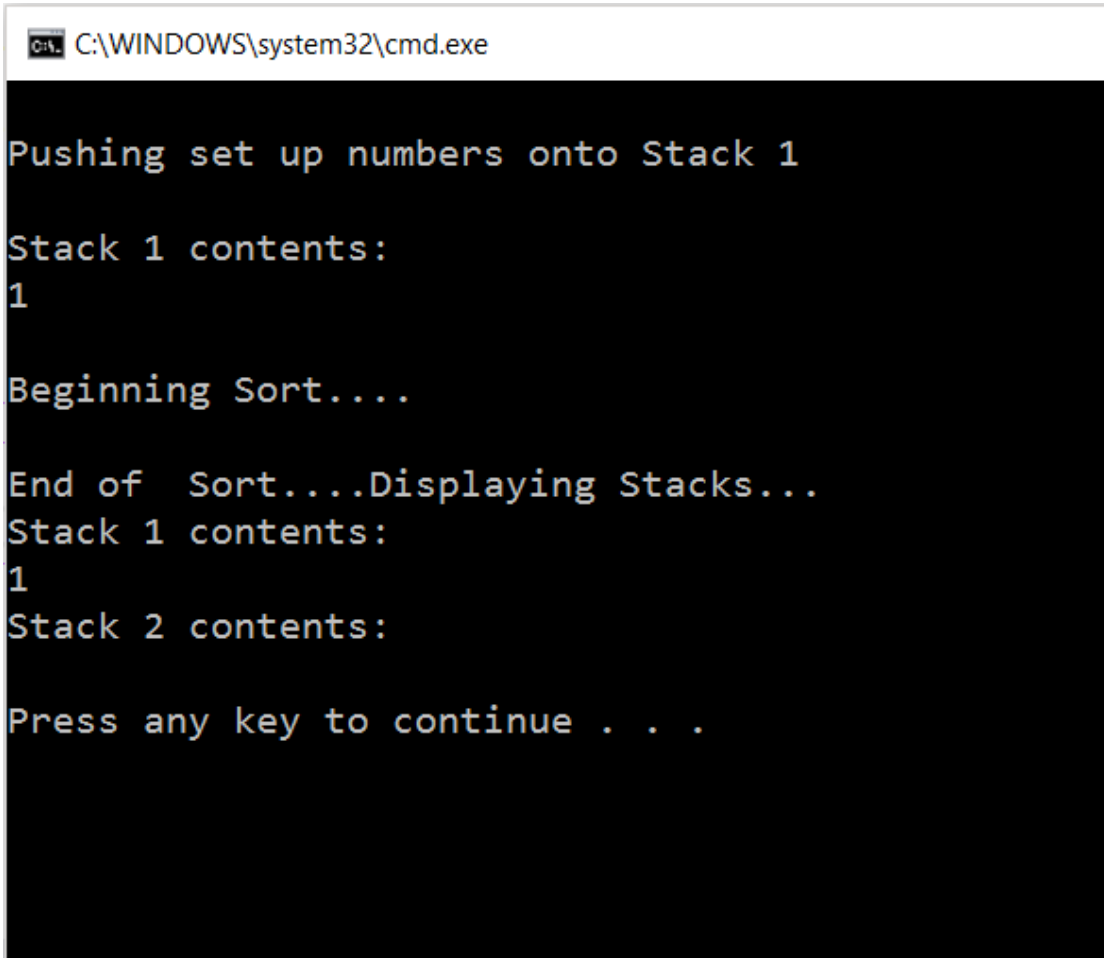
Test Run 3



Explanation

A run was made using the numbers **-1, -4, -4, 6, 6, 9**
which resulted sorted values of **9, 6, 6, -1, -4, -4**.

Test Run 4



Explanation

A run was made using the number **1**
which resulted sorted values of **1**.