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# Sorting: Bubble Sort **■**



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Check out the resources on the page's right side to learn more about bubble sort. The video tutorial is by Gayle Laakmann McDowell, author of the best-selling interview book Cracking the Coding Interview.

Consider the following version of Bubble Sort:

#### Task

Given an n-element array,  $A = a_0, a_1, \dots, a_{n-1}$ , of distinct elements, sort array A in ascending order using the *Bubble Sort* algorithm above. Once sorted, print the following three lines:

- 1. Array is sorted in numSwaps swaps., where **numSwaps** is the number of swaps that took place.
- 2. First Element: firstElement, where *firstElement* is the *first* element in the sorted array.
- 3. Last Element: lastElement, where *lastElement* is the *last* element in the sorted array.

Hint: To complete this challenge, you must add a variable that keeps a running tally of all swaps that occur during execution.

## **Input Format**

The first line contains an integer, n, denoting the number of elements in array A.

The second line contains n space-separated integers describing the respective values of  $a_0, a_1, \ldots, a_{n-1}$ .

### Constraints

- $2 \le n \le 600$
- $1 \leq a_i \leq 2 \times 10^6$ ,  $\forall i \in [0, n-1]$

#### **Output Format**

You must print the following three lines of output:

- 1. Array is sorted in numSwaps swaps., where **numSwaps** is the number of swaps that took place.
- 2. First Element: firstElement, where *firstElement* is the *first* element in the sorted array.
- 3. Last Element: lastElement, where *lastElement* is the *last* element in the sorted array.

#### Sample Input 0

3 1 2 3

# Sample Output 0

```
Array is sorted in 0 swaps.
First Element: 1
Last Element: 3
```

# **Explanation 0**

The array is already sorted, so  $\mathbf{0}$  swaps take place and we print the necessary three lines of output shown above.

# Sample Input 1

3 2 1

## Sample Output 1

```
Array is sorted in 3 swaps.
First Element: 1
Last Element: 3
```

#### **Explanation 1**

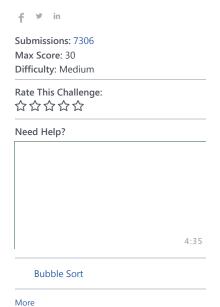
The array is not sorted, and its initial values are: {3, 2, 1}. The following 3 swaps take place:

```
1. \{3, 2, 1\} \rightarrow \{2, 3, 1\}
```

2. 
$$\{2, 3, 1\} \rightarrow \{2, 1, 3\}$$

3. 
$$\{2, 1, 3\} \rightarrow \{1, 2, 3\}$$

At this point the array is sorted and we print the necessary three lines of output shown above.



C# Current Buffer (saved locally, editable)  $\ \mathscr{V} \ \mathfrak{O}$ using System; 2 using System.Collections.Generic; 3 using System.IO; using System.Linq; 5 ▼ class Solution { 6 7 public static int BubbleSort(int[] a) 8 9 int total\_swaps = 0; int n = a.Length; 10 11 12 for (int i = 0; i < n; i++) 13 14 // Track number of elements swapped during a single array traversal 15 int numberOfSwaps = 0;

```
16
17
                         for (int j = 0; j < n - 1; j++)
18 ▼
                              // Swap adjacent elements if they are in decreasing order
19
20
                              if (a[j] > a[j + 1])
21
22
                                   //swap(a[j], a[j + 1]);
23
                                   int temp = a[j];
                                   a[j] = a[j+1];
24
25
                                   a[j + 1] = temp;
26
                                   numberOfSwaps++;
27
                                   total_swaps++;
28
29
                         }
30
31
                         // If no elements were swapped during a traversal, array is sorted
                                                                                                                                         32
                         if (numberOfSwaps == 0)
33
34
                              break;
35
36
37
                    return total_swaps;
38
39
40
41
               static void Main(string[] args)
42
43
                    //int[] a = { 3, 2, 1 };
//int[] a = { 6, 1, 5, 9, 4, 7, 3, 8,2 };
44
45
                    //BubbleSort(a);
46
47
                    //foreach (int elem in a)
48
49
                           Console.Write(elem + " ");
                    //3
50
51
                    int n = Convert.ToInt32(Console.ReadLine());
string[] a_temp = Console.ReadLine().Split(' ');
52
53
54
                    int[] a = Array.ConvertAll(a_temp, e => int.Parse(e));
55
                    int total_swaps = BubbleSort(a);
56
                    Console.WriteLine("Array is sorted in {0} swaps.", total_swaps);
Console.WriteLine("First Element: {0}", a[0]);
Console.WriteLine("Last Element: {0}", a[a.Length - 1]);
57
58
59
60
61
                   // Console.ReadLine();
62
63
64
                                                                                                                           Line: 1 Col: 1
```

<u>♣ Upload Code as File</u> Test against custom input

Run Code

Submit Code

Congrats, you solved this challenge!

✓ Test Case #0

✓ Test Case #1

✓ Test Case #2

Next Challenge

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