Algorithms

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Topics: Bubble Sort

Bubble Sort

TUTORIAL PROBLEMS VISUALIZER BETA

Sorting Algorithms are concepts that every competitive programmer must know. Sorting algorithms can be used for collections of numbers, strings, characters, or a structure of any of these types.

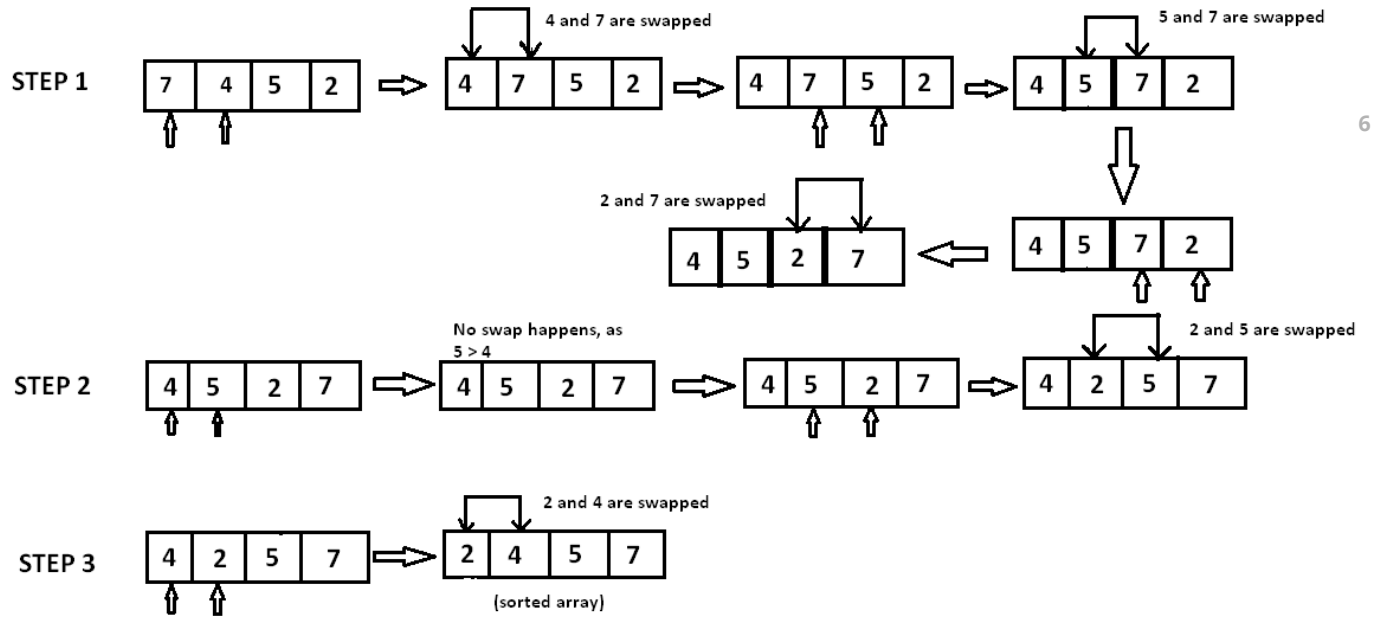
Bubble sort is based on the idea of repeatedly comparing pairs of adjacent elements and then swapping their positions if they exist in the wrong order.

Assume that $A[]$ is an unsorted array of n elements. This array needs to be sorted in ascending order. The pseudo code is as follows:

```
void bubble_sort( int A[ ], int n ) {
    int temp;
    for(int k = 0; k< n-1; k++) {
        // (n-k-1) is for ignoring comparisons of elements which have already been compared
in earlier iterations

        for(int i = 0; i < n-k-1; i++) {
            if(A[ i ] > A[ i+1] ) {
                // here swapping of positions is being done.
                temp = A[ i ];
                A[ i ] = A[ i+1 ];
                A[ i + 1] = temp;
            }
        }
    }
}
```

Lets try to understand the pseudo code with an example: `A [ ] = { 7, 4, 5, 2}`



In step 1, 7 is compared with 4. Since $7 > 4$, 7 is moved ahead of 4. Since all the other elements are of a lesser value than 7, 7 is moved to the end of the array.

Now the array is $A[] = \{4, 5, 2, 7\}$.

In step 2, 4 is compared with 5. Since $5 > 4$ and both 4 and 5 are in ascending order, these elements are not swapped. However, when 5 is compared with 2, $5 > 2$ and these elements are in descending order. Therefore, 5 and 2 are swapped.

Now the array is $A[] = \{4, 2, 5, 7\}$.

In step 3, the element 4 is compared with 2. Since $4 > 2$ and the elements are in descending order, 4 and 2 are swapped.

The sorted array is $A[] = \{2, 4, 5, 7\}$.

Complexity:
The complexity of bubble sort is $O(n^2)$ in both worst and average cases, because the entire array needs to be iterated for every element.

Contributed by: Anand Jaisingh

TEST YOUR UNDERSTANDING

Bubble Sort

You have been given an array *A* of size *N* . you need to sort this array non-decreasing oder using bubble sort. However, you do not need to print the sorted array . You just need to print the number of swaps required to sort this array using bubble sort

Input Format

The first line consists of a single integer *N* denoting size of the array. The next line contains *N* space separated integers denoting the elements of the array.

Output Format Print the required answer in a single line

Constrains $1 \leq N \leq 100$

$1 \leq a[i] \leq 100$

SAMPLE INPUT

```
5
1 2 3 4 5
```

SAMPLE OUTPUT

```
0
```

Enter your code or Upload your code as file. Save C (gcc 5.4.0)

```
/*
// Sample code to perform I/O:
#include <stdio.h>

int main(){
    int num;
    scanf("%d", &num);                          // Reading input from STDIN
    printf("Input number is %d.\n", num);       // Writing output to STDOUT
}

// Warning: Printing unwanted or ill-formatted data to output will cause the test cases to fail
*/

// Write your code here

```