ALG'18: Assignment-4
Array Sorting

Description

You are given an array A of N integers which can be positive, negative, or zero. You want to sort the elements of this array using two sorting algorithms:

- The merge sort algorithm.
- The merge insertion sort algorithm. The merge insertion sort works as the ordinary merge sort **till the array size becomes less than or equal a specific value (threshold),** the insertion sort at this point is applied on the remaining size of the array to complete the sorting process.

Input: Already Implemented

The first line of input is an integer T (T < 30), that indicates the number of test cases. Each case consists of two integers that represents the array size (N) and the threshold at which insertion sort starts to complete the sorting process, followed by the array items.

Output: Already Implemented

The result is the sorted elements of the array.

REQUIRED:

1. **Choose questions and bonus in section2 in the assignment form**
2. **Function: Implement it!**

```
public static int[] SortArray(int[] numbers, int N, int threshold, bool
flag)
```

INPUT:

- An array of N integers
- The array size (N)
- The threshold at which insertion sort starts to complete the sorting process in case of the merge insertion sort. Any Threshold >= 1.
- The sorting algorithm flag (**False**: Merge sort ONLY, **True**: Merge insertion sort)

OUTPUT:

- The sorted array.

Template

- C# template

Test Cases

To test your code, there are two types of cases: Sample and complete cases.

SAMPLE TEST CASES

# of cases = 5, to run them:

1- Run your program
2- Enter '1'

YOU MUST SEE **"Succeed"** for each sample case. Then after all of them, "**Sample cases run successfully**" MUST appeared.

Some of the sample cases:

#	Input Array	Output
1	4 2 3 2 1 4 **[Merge Insertion: Merge sort starts with size 4 and when the array size ≤ 2, the insertion sort will be completed]**	1 2 3 4
2	8 6 21 22 23 26 30 31 33 50 **[Merge Insertion: Merge sort starts with size 8 and when the array size ≤ 6, the insertion sort will be completed]**	21 22 23 26 30 31 33 50
4	10 1 100 90 80 70 60 50 40 30 20 10 **[Merge Insertion: Merge sort starts with size 10 and when the array size ≤ 1, the insertion sort will be completed]**	10 20 30 40 50 60 70 80 90 100

COMPLETE Test Cases

# of cases = 3, all of size = 50,000,000. To run them:

1- Run your program
2- Enter '2'
3- For each case, enter its number and threshold as follows:

YOU MUST SEE **"Succeed"** for each sample case. Then, congratulations at the end of all.

Case #	Input Array	Case number	Threshold
Case1	Sorted array in increasing order	1	30
Case2	Sorted array in decreasing order	2	30
Case3	Unsorted array filled with random numbers	3	30

C# Help

If you need any help regarding the syntax of C#, **ask any TA**.

Creating 1D array

```
int [] array1D = new int [size]
```

Creating 2D array

```
int [,] array2D = new int [size1, size2]
```

Getting the size of 1D array

```
int size = array1D.GetLength(0);
```

Getting the size of 2D array

```
int size1 = array2D.GetLength(0);

int size2 = array2D.GetLength(1);
```