

Computer Science I
Thursday Problem 3/22/2012 – Sorting
Due Friday 3/23/2012 11:59pm on Webcourses

Problem:

You are given a set of n nuts and a set of n bolts, which match. You do not have the ability to compare two nuts to each other to see if one is bigger than the other. You also do not have the ability to compare two bolts to each other to see if they match. But, given one nut and one bolt, you can compare the two of them and determine whether or not they match, or if the nut is too small, or if the nut is too big. Your goal will be to determine an efficient algorithm that takes an array of nuts and an array of bolts, and matches all of the nuts to all of the bolts. (Note: Your final answer need not be in sorted order. It must simply have all of the nuts and bolts correctly matching.)

Implementation:

Your algorithm should take as input an array of nuts and an array of bolts. To make things simpler each array will be an array of integers, but you cannot compare integers from the same array, you can only compare elements from the nuts array to elements of the bolts array. **Your solution should be better than an $O(n^2)$ solution.** Turn in a file named **NutsBolts.c**.

Input File Format (NutsBolts.in):

The file will contain an integer m denoting the number of test cases, followed by n denoting the size of the following arrays, followed by 2 lines containing the integers in each array.

Example Input File (NutsBolts.out):

```
3
5
2 3 1 5 4
3 4 5 1 2
5
2 3 1 5 4
3 2 4 1 5
10
5 3 1 2 4 9 8 0 6 7
7 6 3 5 0 1 2 4 9 8
```

Example Output File (NutsBolts.out):

```
Case #1:
  Before:
    Nuts = [2, 3, 1, 5, 4]
    Bolts = [3, 4, 5, 1, 2]
  After:
    Nuts = [1, 2, 3, 4, 5]
    Bolts = [1, 2, 3, 4, 5]
Case #2:
  Before:
    Nuts = [2, 3, 1, 5, 4]
    Bolts = [3, 2, 4, 1, 5]
  After:
    Nuts = [1, 2, 3, 4, 5]
    Bolts = [1, 2, 3, 4, 5]
Case #3:
  Before:
    Nuts = [5, 3, 1, 2, 4, 9, 8, 0, 6, 7]
    Bolts = [7, 6, 3, 5, 0, 1, 2, 4, 9, 8]
  After:
    Nuts = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
    Bolts = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

