

National Institute of Technology Calicut
Department of Computer Science and Engineering
Third Semester B.Tech. (CSE)
CS2092D Programming Laboratory
Assignment 3

Submission deadline (on or before):

• **11:00 AM, Sunday, 20.08.2023**

Policies for Submission and Evaluation:

- You must submit your assignment in the Eduserver course page, on or before the submission deadline.
- Ensure that your programs will compile and execute without errors in the Linux platform.
- During the evaluation, failure to execute programs without compilation errors may lead to zero marks for that evaluation.
- Detection of ANY malpractice related to the lab course can lead to awarding an F grade in the course.
- Any queries or clarifications on the assignment questions should be submitted on or before 11:00 AM, Saturday, 19/08/2023 in the below spreadsheet:

https://docs.google.com/document/d/1hVCoBUUeaz9PMEDPHPYwIWiD1kmyelluaCFY_hjs7Uk/edit?usp=sharing

Any queries after that will not be entertained.

Naming Conventions for Submission

- Submit a single ZIP (.zip) file (do not submit in any other archived formats like .rar, .tar, .gz).

The name of this file must be

ASSG<NUMBER>_<ROLLNO>_<FIRST-NAME>.zip

(Example: ASSG3_BxxyyyyCS_LAXMAN.zip). DO NOT add any other files (like temporary files, input files, etc.) except your source code, into the zip archive.

- The source codes must be named as

ASSG<NUMBER>_<ROLLNO>_<FIRST-NAME>_<PROGRAM-NUMBER>.c

(For example: ASSG3_BxxyyyyCS_LAXMAN_1.c). If you do not conform to the above naming conventions, your submission might not be recognized by our automated tools, and hence will lead to a score of 0 marks for the submission. So, make sure that you follow the naming conventions.

Standard of Conduct

- Violation of academic integrity will be severely penalized. Each student is expected to adhere to high standards of ethical conduct, especially those related to cheating and plagiarism. Any submitted work MUST BE an individual effort. Any academic dishonesty will result in zero marks in the corresponding exam or evaluation and will be reported to the department council for record keeping and for permission to assign F grade in the course. The department policy on academic integrity can be found at:

<https://minerva.nitc.ac.in/cse/sites/default/files/attachments/news/Academic-Integrity.pdf>.

General Instructions

- Programs should be written in C language and compiled using C compiler in Linux platform. Submit the solutions to questions 1 to 4 through the submission link in Eduserver.

Questions

1. You are the sole maintainer of a museum, where all articles are initially arranged in increasing order of their size in meters. However, another team discovered some new items and placed them randomly after the last arranged item. Now, there's an upcoming festival on D days, and you need to rearrange these scattered items (second part) along with the existing ones (first part) so that visitors can enjoy the fest with minimal confusion. Condition is that in one day, you can rearrange one item from the second part to its correct position in the first part, by appropriately shifting the items. At the end of the day, after the shifting operation the first part increases its size by one. Your task is to provide the complete list of item sizes to your manager, representing the arrangement after D days. (Hint Insertion sort).

Input Format:

- The first line contains integer $N \in [1, 10^3]$ representing numbers of items.
- The second line contains sizes(float) of N elements, $size \in [1, 10^3]$ which represent length in meters.
- Third line contains integer $X \in [0, 10^3]$ representing new items in the items list.
- Fourth line contains an integer $D \in [0, 10^3]$, representing the number of days and $D \leq X$.

Output Format:

- First line contains **all** item's size rearranged in D days. (precise 2 decimal places)

Sample Input:

```
5
2 5 300 2.1 10
3
2
```

Sample Output:

```
2.00 2.10 5.00 300.00 10.00
```

2. You work for an online bookstore that recently migrated its inventory to a new system. However, during the migration process, the books in the inventory got jumbled up, and they need to be sorted again. The bookstore manager has asked you to use the insertion sort algorithm to sort the books by their ISBN (International Standard Book Number), which is a unique identifier for each book. Take ISBN in an integer array `arr[]` and then sort the given array using insertion sort.

Input format:

- The first line of the input contains an integer $n \in [1, 10^3]$, the size of the array 'arr' representing the number of books.
- The second line lists the n elements in 'arr', as space-separated integers in the range $[1, 10^3]$ representing the unsorted ISBN of the books.

Output Format:

- The first line of the output contains the elements of 'arr' in sorted order, separated by space.

Sample input:

```
5
4 1 3 9 7
```

Sample Output:

```
1 3 4 7 9
```

3. In the magical world of Althoria, alchemists are researching an elusive elixir with mystical properties. They've discovered a series of runes that correspond to different ingredients and their potencies. However, the runes are scattered and need to be rearranged to unlock the secret formula. Each rune has a numeric value representing its potency. The alchemists believe that the most potent runes should appear at the beginning of the sequence, gradually decreasing in potency. Your task is to help the alchemists sort the runes in this manner so they can decipher the formula and unlock the elixir's secrets.

Implement a function that takes an array of rune potencies and sorts them using the selection sort algorithm in descending order of potency.

Input Format:

- The first line contains the number of runes $N \in [1, 10^3]$.
- Second line consists of their potencies separated by one space each. Potencies lie in the range $\in [1, 10^3]$.

Output Format:

- A Single line in which potencies are sorted in descending order.

Sample Input:

```
6
46 72 18 4 96 32
```

Sample Output:

```
96 72 46 32 18 4
```

4. Imagine you're an employee at TechCorp, tasked by your manager 'Alex' to analyze sales data. This data contains information about various products and their sales figures. Your goal is to identify the K best-selling products by arranging them in descending order of sales. To achieve this, 'Alex' suggests using a special method, which parallels the process of sorting and prioritizing tasks in an office environment. As you apply this technique to the sales figures, the top-performing products gradually come into focus. Once sorted, you present the list of K top-selling products to Alex, showcasing your analytical skills and efficiency in tackling real-world challenges using sorting strategies.

Input Format:

- The first line contains the no of products. $N \in [1, 1000]$ and $K < N$, separated by a space
- The second line contains the sales figures of the products. $Arr[i]$, where $Arr[i] \in [0, 10^4]$

Output Format:

- One line containing the K highest sales figures in descending order.

Sample Input:

```
5 2
12 5 787 1 23
```

Sample Output:

```
787 23
```