

Islamic University of Technology (IUT)
Organization of Islamic Cooperation (OIC)
Department of Electrical and Electronic Engineering (EEE)

EEE 4416: Simulation Lab

Lab – 04 Assignment

Exercise - 01

Problem statement: The following array contains the ODI ratings of 10 different countries. Take the two arrays as input and find the following -

Rating= [122, 133, 111, 134, 126, 117, 115, 129, 102, 110]

Country = ["IND", "AUS", "SA", "ENG", "SRL", "PAK", "BD", "ZIM", "IRE", "WI"]

- I. What is the maximum, minimum, and average rating of the countries?
- II. How many countries have ratings above the average rating?
- III. Which country has a rating of 115?
- IV. Which 3 countries have the lowest rating?
- V. What is the difference in rating between "SA" and "IRE"?
- VI. Remove "SRL" 's rating from the list.

Outputs –

- I. Maximum = 134, minimum = 102, average = 119.9
- II. 5
- III. "BD"
- IV. ["IRE", "WI", "SA"]
- V. 9
- VI. Rating_updated= [122, 133, 111, 134, 117, 115, 129, 102, 110]

- Avoid hard-coding; determine the index through functions to extract elements from the arrays.

Exercise – 02

Problem statement: Extract prime numbers

Given a list of elements, extract the prime numbers from that array.

Test Case - 01

- Input: [1, 3, 4, 6, 7, 9, 3, 5, 11, 6432, 636451, 323423, 5454, 44363, 223, 55345, 677, 5343]
- Output: [3, 7, 3, 5, 11, 223, 677]

Test case – 02

- Input: [100, 200, 400, 1000]
- Output: []

Exercise – 03

Problem statement: Summing Rows and Columns.

Given a matrix X, 1st add a column to the matrix whose elements are the summation of each row. Then add a row to the matrix whose elements are the summation of all elements above in the same column.

Test case - 01:

- Input: X= [1, 2, 3;
4, 5, 6;
7, 8, 9]
- Output: y= [1, 2, 3, 7;
4, 5, 6, 15;
7, 8, 9, 24;
12, 15, 18, 45]

Test Case - 02:

- Input: x= [2, 5;
3, 8]
- Output: y= [2, 5, 7;
3, 8, 11;
5, 13, 18]

Exercise – 04*

Problem statement: Min-Max

An array is provided. For example, $a = [2, 1, 11, 4, 5, 13]$

Create an array from 'a' this way, $out = [1, 11, 2, 13, 4, 5]$

- First, take the smallest element from a and put it in the output array.
- Then take the largest element from a and put it in the output array.
- Next, take the 2nd smallest element from a and put it in the output array.
- Then take the 2nd largest element from a and put it in the output array.

And so on until all the elements are taken.

- ✓ There are many ways to do it. Try to come up with a way to do it by yourself.

Test Case - 02

- Input: $a = [10, 2, 30, 4, 3, 2, 34, 7, 9]$
- Output: $[2, 34, 2, 30, 3, 10, 4, 9, 7]$

Test case – 03

- Input: $[100, 200, 400, 1000]$
- Output: $[100, 1000, 200, 400]$

- ✓ Be careful. The length of the array can be 100 or 1000. Your code should perform correctly for all cases.

Exercise - 05

Problem Statement:

```
data= [ 120  120  100  80  40
        180  120  150  80  80
        150   80  150  80  55
        195   80  150  80  45
        40 NaN   30  80 NaN
        100  50  80  80 NaN
        50  50 NaN  80  30]
```

We want to modify our original data. Here, each column represents a university while each row represents a department.

Columns are – [BUET RUET KUET CUET IUT]

Rows are – [CSE EEE ME CIVIL CE Architecture Management]

Re-create the data for each of the following cases separately -

- i. BUET (1st column) wants to add 30 students to each department.
- ii. IUT (5th column) wants to double the no. of students in each department.
- iii. All the universities want to decrease the no. of EEE students by 10.
- iv. All the universities want to remove the CE department (remove row 5).
- v. RUET wants to increase their civil department students by 30.
- vi. KUET wants to increase each department's students by [5,10,5,10,10,5] respectively.
- vii. Extract the data of IUT after modification.
- viii. Perform data visualization.

✓ Take a closer look at what is happening in the nan cases.

Exercise - 06

Problem Statement: [Anagram](#)

An anagram is a word or phrase formed by rearranging the letters of another word or phrase, using all the original letters exactly once. Given two strings, check whether they're anagrams to each other or not.

Test Case - 01

- Input: a = 'listen', b = 'silent'
- Output: true

Test Case - 02

- Input: a = 'evil', b = 'vile'
- Output: true

Test Case - 03

- Input: x = "aaabbccd", y= "abbccddd"
- Output: false

Test Case - 04

- Input: a = 'evil', b = 'vibe'
- Output: false

Exercise - 07

Problem statement: Given an array or a matrix, find all the integers that are a multiple of 3 or 5. Return the result in sorted order without any repetitions. (try using Boolean masking, without any loops)

Test Case – 01:

➤ Input:

```
[1 2 3 6
 4 5 6 7
 7 8 9 -15]
```

➤ Output: [-15, 3, 5, 6, 9]

Test Case – 02:

▪ Input: [16 2 3 12.2

5 11 10 8

9 7 6 12

4 14 15 3.5]

▪ Output: sort ([3, 12, 15, 9, 5, 10, 6])

Exercise – 08*

Problem statement: Write a code that will take a 2D matrix as input, and it will return the output as a row matrix with all the elements associated in a clockwise spiral pattern.

Test Case – 01:

➤ Input:

```
[1 2 3  
 4 5 6  
 7 8 9]
```

➤ Output: [1, 2, 3, 6, 9, 8, 7, 4, 5]

Test Case – 02:

▪ Input: [16 2 3 13

5 11 10 8

9 7 6 12

4 14 15 1]

▪ Output: [16, 2, 3, 13, 8, 12, 1, 15, 14, 4, 9, 5, 11, 10, 6, 7]

Hint: The `rot90()` function rotates your matrix by 90 degrees.

Exercise – 09*

Problem statement: Given a matrix a, return a matrix b in which all the zeros have "bubbled" to the top. That is, any zeros in a given column should be moved to the top. The order of the remaining nonzero numbers in the column should be preserved.

Test Case – 01:

```
Input  a  =  [1 2 3
               0 4 5
               6 0 0]
```

```
Output b is [0 0 0
              1 2 3
              6 4 5]
```

Test Case – 02:

```
Input  a  = [1 0 5 0 6 0 7]'
Output b is [0 0 0 1 5 6 7]'
```

Test Case – 03:

```
Input  a  = [1 0
              1 1]
Output b is [1 0
              1 1]
```