Islamic University of Technology (IUT)

Organization of Islamic Cooperation (OIC)

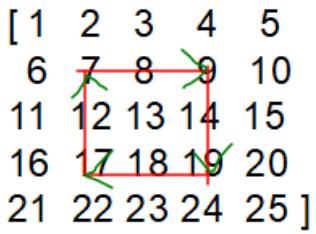
Department of Electrical and Electronic Engineering (EEE)

Exercise - 01:

Given a matrix of size (m,n) – extract the 2nd layer in a cyclic way.

For example, for the matrix in the figure, the output should be –

Out = [7,8,9,14,19,18,17,12]



Test Case – 02:

- Input: x= magic(5)
- Output: [5, 7, 14, 20, 21, 19, 12, 6]

- Output has to be a row vector
- m,n >=3
- Careful, there shouldn't be any repetitions.

Exercise - 02:

An array is given (even no. of inputs). Encode it in the following way –

Input: [3, 2, 1, 5, 4, 1]

Output: [2,2,2, 5, 1,1,1,1]

Explanation: Look at the input array elements pair-wise.

- 1st pair is (3, 2) == three, 2's.
- 2nd pair is (1, 5) == one, 5.
- 3rd pair is (4,1) == four, 1's.

Test Case – 02:

- Input: [2, 9]
- Output: [9, 9]

Test Case – 03:

- Input: [1, 2, 1, 3, 1, 4, 7,0]
- Output: [2,3,4,0,0,0,0,0,0,0]

Exercise - 03:

A vampire number(v) is a number with even number of digits that has a factorization v= i*j.

Here, i and j have to satisfy the following conditions –

- Both of them have half as many digits as the original number v.
- Maximum one of them can be divisible by 10.
- The digits in v consists of the digits of x and y.

i and j are called the fangs of the number v.

For example,

- 1260 = 21 * 60
  - ✓ v=1260 has 4 digits while 21 and 60 have 2 digits (half).
  - ✓ Only one of them is divisible by 10.
  - ✓ Digits in 21 and 60 make 2160.
- 1260 = 28 * 45
  - ✓ 1st condition is satisfied.
  - ✓ 2nd condition is also satisfied.
  - ✓ 3rd condition fails.

Hence, [21,60] are the fangs of 1260. While [28,45] are not.

Given a vampire number, find the fangs of that number.

In case of multiple fangs, return only one.

Test Case – 02:

- Input: 150300
- Output: [300, 501]

Exercise - 04:

Three row vector a, b, c is given. They are of same size.

I. Create a table from them [so your table should have 3 columns].
II. Add a new column named 'max' to your table that contains the maximum of the three.
III. Add a new column named 'min' to your table that contains the minimum of the three.
IV. Sort the rows based on the 3rd column.

Test Case:

- Input: a= [2,3,4], b= [6,2,4], c= [9,14,2]
- Output:

  After Step - 03

```
t =

  3×5 table

    a    b    c    max    min
    _    _    __   ___    ___

    2    6     9    9      2
    3    2    14   14      2
    4    4     2    4      2
```

  After Step - 04

```
  3×5 table

    a    b    c    max    min
    _    _    __   ___    ___

    4    4     2    4      2
    2    6     9    9      2
    3    2    14   14      2
```

- The final table should be returned as output.

Exercise - 05:

Given a string which is a mail address, e.g. ‘abcd@iut-dhaka.edu’

find the following –

I. The user name [‘abcd’]
II. Change the .edu part to .com [‘abcd@iut-dhaka.com’]
III. Find the institution name [‘iut’]

Test Case – 02:

- Input: ‘ssssss@uct-uk.edu’
- Output:
  i. ‘ssssss’
  ii. ‘ssssss@uct-uk.com’
  iii. ‘uct’

- The email will always be in the aforementioned format.
- Input will be a character array; so should be the output.

Exercise - 06:

Say you want to withdraw some money from the ATM booth in IUT and the machine provides 1000, 500 and 100 taka notes. Now, the machine always wants to return minimum no. of notes i.e. it prefers to give one 1000 tk notes compared to giving ten 100tk notes.

To withdraw x (input) amount of money, what is the minimum number of notes the atm can provide?

For example, if you want to withdraw 2600 taka, then the answer should be 4 [2 – 1000tk,

1 – 500tk, 1-100tk].

You can also get 2600 taka by other ways but that will not be optimal way.

Test Case:

- Input: 4900
- Output: 9

Exercise - 07:

Write a function 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 spiral pattern.

- Input:
  [1 2 3
  4 5 6
  7 8 9]
- Output: [1,2,3,6,9,8,7,4,5]

- The matrix is of size (m,n)

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: rot90( ) rotates your matrix by 90 degree.