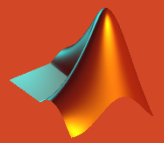
# MATLAB Projects

MATLAB Projects For Water Engineering Students



MATLAB

# Project 01: TWO SUM — Easy

Given an array of integers, return **indices** of the two numbers such that they add up to a specific **target**.

You may assume that each input would have ***exactly*** one solution, and you may not use the *same* element twice.

**Example 01**

>> Please Input An Array of Integers: [1, 5, 7, 2, 11, 20]
>> Please Input Specific Target: 3

>> Answer Is:
*1 4*

**Example 02**

>> Please Input An Array of Integers: [1, 5, 7, 2, 11, 20]
>> Please Input Specific Target: 6

>> Answer Is:
*No Answer*

# Project 02: LONGEST PALINDROMIC SUBSTRING — Medium

Given a string s, find the longest PALINDROMIC substring in s. You may assume that the maximum length of s is 1000.

For example **'abccba'** and **'aba'** and '**cc'** is PALINDROMIC substrings.

**Example 01**

>> Please Input A String: 'abdceeca'

>> Answer Is:
ceec

**Example 02**

>> Please Input A String: 'abdcebca'

>> Answer Is:
*No Answer*

# Project 03: REVERSE INTEGER Easy

Given a integer, reverse digits of an integer.

**Example 01**

>> Please Input A Integer: 1254

>> Answer Is:
4521

**Example 02**

>> Please Input A Integer: 120

>> Answer Is:
21

# Project 04: PALINDROME NUMBER Easy

Determine whether an integer is a **PALINDROME**. An integer is a palindrome when it reads the same backward as forward.

**Example 01**

>> Please Input A Integer: 121

>> Answer Is:
TRUE

**Example 02**

>> Please Input A Integer: 10

>> Answer Is:
FALSE

# Project 05: INTEGER TO ROMAN Medium

Roman numerals are represented by seven different symbols: I, V, X, L, C, D and M.

| Symbol | Value |
|---|---|
| I | 1 |
| V | 5 |
| X | 10 |
| L | 50 |
| C | 100 |
| D | 500 |
| M | 1000 |

For example, two is written as II in Roman numeral, just two one's added together.
Twelve is written as, XII, which is simply X + II.
The number twenty seven is written as XXVII, which is XX + V + II.

Roman numerals are usually written largest to smallest from left to right. However, the numeral for four is not IIII. Instead, the number four is written as IV. Because the one is before the five we subtract it making four. The same principle applies to the number nine, which is written as IX. There are six instances where subtraction is used:

- I can be placed before V (5) and X (10) to make 4 and 9.
- X can be placed before L (50) and C (100) to make 40 and 90.
- C can be placed before D (500) and M (1000) to make 400 and 900.

Given an integer, convert it to a roman numeral. Input is guaranteed to be within the range from 1 to 1000.

# Project 05: INTEGER TO ROMAN Medium

**Example 01**

>> Please Input A Integer: 58

>> Answer Is:
LVIII

>> *% Explanation: L = 50, V = 5, III = 3.*

**Example 02**

>> Please Input A Integer: 9

>> Answer Is:
IX

| Symbol | Value |
|---|---|
| I | 1 |
| V | 5 |
| X | 10 |
| L | 50 |
| C | 100 |
| D | 500 |
| M | 1000 |

# Project 06: 3 SUM Medium

Given an array nums of n integers, are there elements a, b, c in nums such that a + b + c = 0? Find all unique triplets in the array which gives the sum of zero.

**Example 01**

>> Please Input A Array: [-1, 0, 1, 2, -1, -4]

>> Answer Is:

```
-1   0   1
-1   -1   2
```

**Example 02**

>> Please Input A Integer: [-1, 1, 2, -4]

>> Answer Is:

No Answer

# Project 07: LETTER COMBINATIONS OF A PHONE NUMBER Medium

Given a string containing digits from 2-9 inclusive, return all possible letter combinations that the number could represent.
A mapping of digit to letters (just like on the telephone buttons) is given below. Note that 1 does not map to any letters.


**Example 01**

>> Please Input A String: "23"

>> Answer Is:
"ad", "ae", "af", "bd", "be", "bf", "cd", "ce", "cf"

# Project 08: VALID PARENTHESES — Easy

Given a string containing just the characters '(', ')', '{', '}', '[' and ']', determine if the input string is valid.
An input string is valid if:

- Open brackets must be closed by the same type of brackets.
- Open brackets must be closed in the correct order.
- Note that an empty string is also considered valid.

**Example 01**

>> Please Input A String: '( )'

>> Answer Is:
TRUE

**Example 02**

>> Please Input A String: '( ) [ ] { }'

>> Answer Is:
TRUE

**Example 03**

>> Please Input A String: '{ [ ] }'

>> Answer Is:
TRUE

**Example 04**

>> Please Input A String: '( ]'

>> Answer Is:
FALSE

# Project 09: SEARCH INSERT POSITION — Easy

Given a sorted array and a target value, return the index if the target is found. If not, return the index where it would be if it were inserted in order.

* You may assume no duplicates in the array.

**Example 01**

>> Please Input A Array: [1, 3, 5, 6]
>> Please Input Target : 5

>> Answer Is:
3

**Example 02**

>> Please Input A Array: [1, 3, 5, 6]
>> Please Input Target : 2

>> Answer Is:
2

**Example 03**

>> Please Input A Array: [1, 3, 5, 6]
>> Please Input Target : 7

>> Answer Is:
5

**Example 04**

>> Please Input A Array: [1, 3, 5, 6]
>> Please Input Target : 0

>> Answer Is:
1

# Project 10: COMBINATION SUM — Medium

Given a collection of candidate numbers (candidates) and a target number (target), find all unique combinations in candidates where the candidate numbers sums to target.

* Each number in candidates may only be used once in the combination.

**Example 01**

>> Please Input A Array: [10,1,2,7,6,1,5]
>> Please Input Target : 8

>> Answer Is:

```
1  7
1  2  5
2  6
1  1  6
```

**Example 02**

>> Please Input A Array: [2,5,2,1,2]
>> Please Input Target : 5

>> Answer Is:

```
1  2  2
5
```

# Project 11: MULTIPLY STRINGS — Medium

Given two non-negative integers num1 and num2 represented as strings, return the product of num1 and num2, also represented as a string.

Note:
* The length of both num1 and num2 is < 110.
* Both num1 and num2 contain only digits 0-9.
* Both num1 and num2 do not contain any leading zero, except the number 0 itself.
* You must not use any built-in function or convert the inputs to integer directly.

**Example 01**

>> Please Input num1: '2'
>> Please Input num2: '8'

>> Answer Is:
'16'

**Example 02**

>> Please Input num1: '123'
>> Please Input num2: '456'

>> Answer Is:
' 56088'

# Project 12: PERMUTATIONS Medium

Given a collection of distinct integers, return all possible permutations.

Note:
* You must not use any built-in function.

**Example 01**

>> Please Input A Array: [1, 2, 3]

>> Answer Is:

```
1  2  3
1  3  2
2  1  3
2  3  1
3  1  2
3  2  1
```

**Example 02**

>> Please Input A Array: [1, 5]

>> Answer Is:

```
1  5
5  1
```

# Project 13: Pow(x, n) Medium

Implement pow(x, n), which calculates x raised to the power n ($x^n$).

Note:
- -100.0 < x < 100.0
- n is a integer, within the range [-1000, 1000]

**Example 01**

```
>> Please Input X: 2
>> Please Input n: 10

>> Answer Is:
                1024
```

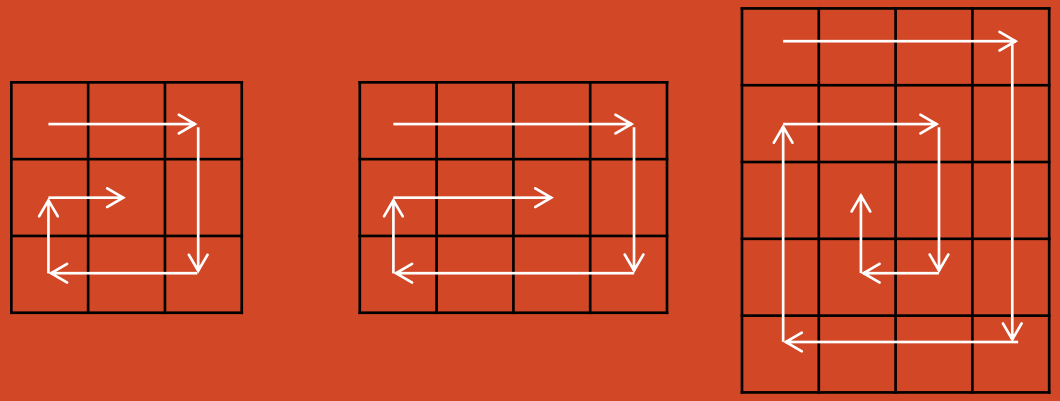
**Example 02**

```
>> Please Input X: 2
>> Please Input n: -2

>> Answer Is:
                0.25
```

# Project 14: SPIRAL MATRIX 01 Medium

Given a matrix of m x n elements (m rows, n columns), return all elements of the matrix in spiral order.



**Example 01**

>> Please Input A Matrix: [1, 2, 3; 4, 5, 6; 7, 8, 9]

>> Answer Is:

1 2 3 6 9 8 7 4 5

**Example 02**

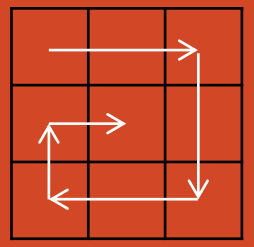
>> Please Input A Matrix: [1, 2, 3, 4; 5, 6, 7, 8; 9, 10, 11, 12]

>> Answer Is:

1 2 3 4 8 12 11 10 9 5 6 7

# Project 15: SPIRAL MATRIX 02 Medium

Given a positive integer n, generate a square matrix filled with elements from 1 to $n^2$ in spiral order



**Example 01**

>> Please Input A Positive Integer: 3

>> Answer Is:

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

**Example 02**

>> Please Input A Positive Integer: 2

>> Answer Is:

```
1 2
4 3
```

# Project 16: SET MATRIX ZEROES — Medium

Given a m x n matrix, if an element is 0, set its entire row and column to 0. Do it in-place.

Note:
* You must not use any built-in function.

**Example 01**

>> Please Input A Matrix: [1, 1, 1; 1, 0, 1; 1, 1, 1]

>> Answer Is:

```
1  0  1
0  0  0
1  0  1
```

**Example 02**

>> Please Input A Matrix: [0, 1, 2, 0; 3, 4, 5, 2; 1, 3, 5]

>> Answer Is:

```
0  0  0  0
0  4  5  0
0  3  1  0
```

# Project 17: SORT COLORS Medium

Given an array with n objects colored red, white or blue, sort them in-place so that objects of the same color are adjacent, with the colors in the order red, white and blue.
Here, we will use the integers 0, 1, and 2 to represent the color red, white, and blue respectively.
Note:

- You are not suppose to use the sort function for this problem.

**Example 01**

>> Please Input Colors: [2,0,1,1]

>> Answer Is:
0 1 1 2

**Example 02**

>> Please Input Colors: [2,0,2,1,1,0]

>> Answer Is:
0 0 1 1 2 2

# Project 18: WORD SEARCH Medium

Given a 2D board and a word, find if the word exists in the grid.

* The word can be constructed from letters of sequentially adjacent cell, where "adjacent" cells are those horizontally or vertically neighboring.
* The same letter cell may not be used more than once.

**Example 01**

>> Please Input A Matrix of Letters:
['A', 'B', 'C', 'E'; 'S', 'F', 'C', 'S'; 'A', 'D', 'E', 'E']

>> Given word: 'ABCCED'

>> Answer Is:
TRUE

**Example 02**

>> Please Input A Matrix of Letters:
['A', 'B', 'C', 'E'; 'S', 'F', 'C', 'S'; 'A', 'D', 'E', 'E']

>> Given word: 'ABCB'

>> Answer Is:
FALSE

# Project 19: REMOVE DUPLICATES FROM SORTED LIST 01 Easy

Given a sorted linked list, delete all nodes that have duplicate numbers, leaving only distinct numbers from the original list.

**Example 01**

>> Please Input A Array: [1, 2, 3, 3, 4, 4, 5]

>> Answer Is:
1 2 5

**Example 02**

>> Please Input A Array: [1, 1, 1, 2, 3]

>> Answer Is:
2 3

# Project 20: REMOVE DUPLICATES FROM SORTED LIST 01 Easy

Given a sorted linked list, delete all duplicates such that each element appear only once.

**Example 01**

>> Please Input A Array: [1, 2, 3, 3, 4, 4, 5]

>> Answer Is:
1 2 3 4 5

**Example 02**

>> Please Input A Array: [1, 1, 1, 2, 3]

>> Answer Is:
1 2 3

# Project 21: DECODE WAYS — Medium

A message containing letters from A-Z is being encoded to numbers using the following mapping:

```
'A' -> 1
'B' -> 2
...
'Z' -> 26
```

Given a non-empty string containing only digits, determine the total number of ways to decode it.

**Example 01**

>> Please Input A Positive Integer: 12

>> Answer Is:
2

*>> % It could as "AB" (1  2) or "L" (12).*

**Example 02**

>> Please Input A Positive Integer: 226

>> Answer Is:
3

*>> It could be "BZ" (2  26), "VF" (22  6), or "BBF" (2  2  6)*

# Project 22: NUMBER OF ISLANDS Medium

Given a 2d grid map of '1's (land) and '0's (water), count the number of islands.

Note:
* An island is surrounded by water and is formed by connecting adjacent lands horizontally or vertically.
* You may assume all four edges of the grid are all surrounded by water.

**Example 01**

>> Please Input a 2d Grid Map:

```
1 0 1 1 0
0 1 1 0 1
0 0 1 1 0
0 1 1 1 0
1 0 0 0 1
```

>> Answer Is:
4

**Example 02**

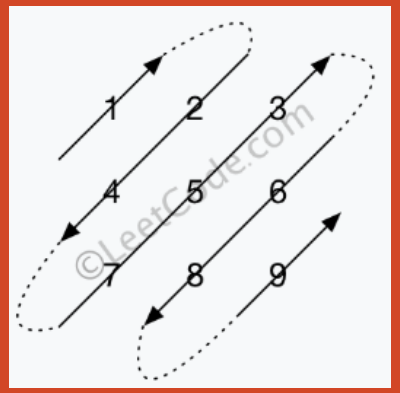
>> Please Input a 2d Grid Map:

```
1 1 0 1 0
0 1 1 0 1
0 0 1 1 1
```

>> Answer Is:
1

# Project 23: DIAGONAL TRAVERSE — Medium

Given a matrix of M x N elements (M rows, N columns), return all elements of the matrix in diagonal order as shown in the below image.




**Example 01**

>> Please Input A Matrix: [1, 2, 3; 4, 5, 6; 7, 8, 9]

>> Answer Is:

1 2 4 7 5 3 6 8 9

**Example 02**

>> Please Input A Matrix: [1, 2, 3; 4, 5, 6]

>> Answer Is:

1 2 4 3 5 6

# Project 24: TO LOWER CASE Easy

Implement function ToLowerCase() that has a string parameter str, and returns the same string in lowercase.

Note:
- You are not suppose to use the lower function for this problem.

**Example 01**

>> Please Input A String: 'Hello'

>> Answer Is:
hello

**Example 02**

>> Please Input A String: 'here'

>> Answer Is:
here

# Project 25: TO UPPER CASE — Easy

Implement function ToUpperCase() that has a string parameter str, and returns the same string in uppercase.

Note:
- You are not suppose to use the upper function for this problem.

**Example 01**

>> Please Input A String: 'Hello'

>> Answer Is:
HELLO

**Example 02**

>> Please Input A String: 'HERE'

>> Answer Is:
HERE

# Project 26: MINIMUM ADD TO MAKE PARENTHESES VALID — Medium

Given a string S of '(' and ')' parentheses, we add the minimum number of parentheses ( '(' or ')', and in any positions ) so that the resulting parentheses string is valid.

Formally, a parentheses string is valid if and only if:

- It is the empty string, or
- It can be written as AB (A concatenated with B), where A and B are valid strings, or
- It can be written as (A), where A is a valid string.

Given a parentheses string, return the minimum number of parentheses we must add to make the resulting string valid.

**Example 01**

>> Please Input A String: '( ) )'

>> Answer Is:

1

**Example 02**

>> Please Input A String: '( ) ) ) ( ('

>> Answer Is:

4

# Project 27: TRANSPOSE MATRIX Easy

Given a matrix A, return the transpose of A.
The transpose of a matrix is the matrix flipped over it's main diagonal, switching the row and column indices of the matrix.
Note:

- You are not suppose to use the (') for this problem.

**Example 01**

```
>> Please Input A Matrix: [1, 2, 3; 4, 5, 6; 7, 8, 9]

>> Answer Is:
     1     4     7
     2     5     8
     3     6     9
```

**Example 02**

```
>> Please Input A Matrix: [1, 2, 3; 4, 5, 6]

>> Answer Is:
     1     4
     2     5
     3     6
```

# Project 28: SINGLE NUMBER Easy

Given a non-empty array of integers, every element appears twice except for one. Find that single one.

**Example 01**

>> Please Input A Array: [2, 2, 1]

>> Answer Is:
1

**Example 02**

>> Please Input A Array: [2, 2, 1, 3, 4, 5, 4]

>> Answer Is:
1 3

# Project 29: RESHAPE THE MATRIX — Easy

In MATLAB, there is a very useful function called 'reshape', which can reshape a matrix into a new one with different size but keep its original data.

You're given a matrix represented by a two-dimensional array, and two positive integers r and c representing the row number and column number of the wanted reshaped matrix, respectively.
The reshaped matrix need to be filled with all the elements of the original matrix in the same row-traversing order as they were.

Note:
- The height and width of the given matrix is in range [1, 100].
- The given r and c are all positive.

**Example 01**

```
>> Please Input A Matrix: [1, 2; 3, 4]
>> Please Input r: 1
>> Please Input c: 4

>> Answer Is:
        1    2    3    4
```

**Example 02**

```
>> Please Input A Matrix: [1, 2; 3, 4]
>> Please Input r: 2
>> Please Input c: 4

>> Answer Is:
        NO WAY
```

# Project 30: FIND ALL DUPLICATES IN AN ARRAY — Medium

Given an array of integers, some elements appear duplicates.

Find all the elements that appear n times in this array.

**Example 01**

>> Please Input A Array: [4, 3, 2, 7, 8, 2, 3, 1, 7, 2, 7, 7]
>> Please Input n: 4

>> Answer Is:
7

**Example 02**

>> Please Input A Array: [4, 3, 2, 7, 8, 2, 3, 1, 7, 2, 7, 7]
>> Please Input n: 1

>> Answer Is:
4 8 1

**Example 03**

>> Please Input A Array: [4, 3, 2, 7, 8, 2, 3, 1, 7, 2, 7, 7]
>> Please Input n: 2

>> Answer Is:
3

**Example 04**

>> Please Input A Array: [4, 3, 2, 7, 8, 2, 3, 1, 7, 2, 7, 7]
>> Please Input n: 5

>> Answer Is:
NO WAY

# Project 31: UNCOMMON WORDS FROM TWO SENTENCES — Easy

We are given two sentences A and B.
(A sentence is a string of space separated words. Each word consists only of lowercase letters.)

A word is uncommon if it appears exactly once in one of the sentences, and does not appear in the other sentence.

Return a list of all uncommon words.

* You may return the list in any order.

**Example 01**

>> Please Input A: 'this apple is sweet'
>> Please Input B: 'this apple is sour'

>> Answer Is:
sweet sour

**Example 02**

>> Please Input A: 'apple apple'
>> Please Input B: 'banana'

>> Answer Is:
banana

# Project 32: TOEPLITZ MATRIX Easy

A matrix is Toeplitz if every diagonal from top-left to bottom-right has the same element.

Now given an M x N matrix, return True if and only if the matrix is Toeplitz.

**Example 01**

>> Please Input A Array:

```
1  2  3  4
5  1  2  3
9  5  1  2
```

>> Answer Is:
TRUE

**Example 02**

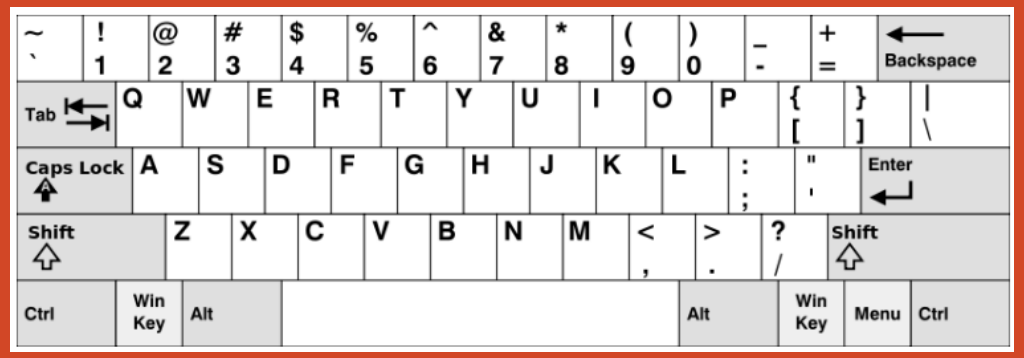
>> Please Input A Array:

```
1  2
2  2
```

>> Answer Is:
FALSE

# Project 33: KEYBOARD ROW — Easy

Given a word, return the true that can be typed using letters of alphabet on only one row's of American keyboard like the image below.




Note:

- You may use one character in the keyboard more than once.
- You may assume the input string will only contain letters of alphabet.

**Example 01**

>> Please Input A String: 'Alaska'

>> Answer Is:
TRUE

**Example 02**

>> Please Input A String: 'hello'

>> Answer Is:
FALSE

# Project 34: SHORTEST DISTANCE TO A CHARACTER — Easy

Given a string **S** and a character **C**, return an array of integers representing the shortest distance from the character **C** in the string.

Note:

- S string length is in [1, 10000].
- C is a single character, and guaranteed to be in string S.
- All letters in S and C are lowercase.

**Example 01**

>> Please Input S: 'loveleetcode'
>> Please Input C: 'e'

>> Answer Is:
3 2 1 0 1 0 0 1 2 2 1 0

**Example 02**

>> Please Input S: 'hello'
>> Please Input C: 'l'

>> Answer Is:
2 1 0 0 1

# Project 35: REVERSE STRING — Easy

Write a function that takes a string as input and returns the string reversed.

**Example 01**

>> Please Input A String: 'Alaska'

>> Answer Is:

aksalA

**Example 02**

>> Please Input A String: 'A man, a plan.'

>> Answer Is:

.nalp a ,nam A

# Project 36: REVERSE WORDS IN A STRING Easy

Given a string, you need to reverse the order of characters in each word within a sentence while still preserving whitespace and initial word order.

**Example 01**

>> Please Input A String: ‘Let's take LeetCode’

>> Answer Is:

s’tel ekat edoCteeL

**Example 02**

>> Please Input A String: ‘A man, a plan.’

>> Answer Is:

A ,nam a .nalp

# Project 37: DAILY TEMPERATURES Easy

Given a list of daily temperatures T, return a list such that, for each day in the input, tells you how many days you would have to wait until a warmer temperature.
If there is no future day for which this is possible, put 0 instead.

Note:

- The length of temperatures will be in the range [1, 30000].
- Each temperature will be an integer in the range [30, 100].

**Example 01**

>> Please Input Temp: [73, 74, 75, 71, 69, 72, 76, 73]

>> Answer Is:
1 1 4 2 1 1 0 0

**Example 02**

# Project 38: MONOTONIC ARRAY Easy

An array is monotonic if it is either monotone increasing or monotone decreasing.
An array A is monotone increasing if for all i <= j, A[i] <= A[j].
An array A is monotone decreasing if for all i <= j, A[i] >= A[j].

Return true if and only if the given array A is monotonic.

**Example 01**

>> Please Input A Array: [1, 2, 2, 3]

>> Answer Is:

TRUE

**Example 02**

>> Please Input A Array: [6, 5, 4, 2, 2]

>> Answer Is:

TRUE

**Example 03**

>> Please Input A Array: [1, 3, 2]

>> Answer Is:

FALSE

**Example 04**

# Project 39: SUM OF TWO INTEGERS — Easy

Calculate the sum of two integers a and b, but you are not allowed to use the operator + and – and sum function.

**Example 01**

```
>> Please Input A: 2
>> Please Input B: 1

>> Answer Is:
                3
```

**Example 02**

```
>> Please Input A: 2
>> Please Input B: -1

>> Answer Is:
                1
```

# Project 40: MISSING NUMBER Easy

Given an array containing n distinct numbers taken from 0, 1, 2, ..., n, find the numbers that is missing from the array.

**Example 01**

>> Please Input n: [3, 0, 1]

>> Answer Is:
2

**Example 02**

>> Please Input n: [9, 4, 2, 3, 5, 7, 0, 1]

>> Answer Is:
6 8

# Project 41: MINIMUM PATH SUM — Medium

Given a m x n grid filled with non-negative numbers, find a path from top left to bottom right which minimizes the sum of all numbers along its path.

Note:
* You can only move either down or right at any point in time.

**Example 01**

```
>> Please Input A Array:   1   3   1
                           1   5   1
                           4   2   1

>> Answer Is:
           7

>> % Because the path 1→3→1→1→1 minimizes the sum.
```

**Example 02**

```
>> Please Input A Array:   1   0
                           1   3

>> Answer Is:
           4

>> % Because the path 1→0→3 minimizes the sum
```

# Project 42: MAXIMUM AVERAGE SUBARRAY — Easy

Given an array consisting of n integers, find the contiguous subarray of given length k that has the maximum average value. And you need to output the maximum average value.

Note:

- 1 <= k <= n <= 30,000.
- Elements of the given array will be in the range [-10,000, 10,000].

**Example 01**

>> Please Input A Array: [1, 12, -5, -6, 50, 3]
>> Please Input K: 4

>> Answer Is:
12.75

>> *% Maximum average is (12-5-6+50)/4 = 51/4 = 12.75.*

**Example 02**

>> Please Input A Array: [1, 0, 3, -6, 1, 3]
>> Please Input K: 3

>> Answer Is:
1.33

>> *% Maximum average is (1+0+3)/3 = 4/3 = 1.33*

# Project 43: MAXIMAL RECTANGLE Hard

Given a 2D binary matrix filled with 0's and 1's, find the largest rectangle containing only 1's and return its area.

**Example 01**

>> Please Input A Array:

1 0 1 0 0
1 0 1 1 1
1 1 1 1 1
1 1 0 1 0

>> Answer Is:

6

**Example 02**

>> Please Input A Array:

1 1 1 0 0
1 1 1 1 1
1 1 1 0 1
1 1 0 1 0

>> Answer Is:

8

# Project 44: MAXIMAL SQUARE Hard

Given a 2D binary matrix filled with 0's and 1's, find the largest square containing only 1's and return its area.

**Example 01**

>> Please Input A Array:

1 0 1 0 0
1 0 1 1 1
1 1 1 1 1
1 1 1 1 1

>> Answer Is:

9

**Example 02**

>> Please Input A Array:

1 1 1 0 0
1 1 1 1 1
1 1 1 0 1
1 1 0 1 0

>> Answer Is:

4

# Project 45: FIND THE CLOSEST PALINDROME — Hard

Given an integer n, find the closest integer (not including itself), which is a palindrome.
The 'closest' is defined as absolute difference minimized between two integers.
Note:

- The input n is a positive integer.
- If there is a tie, return the smaller one as answer.

**Example 01**

>> Please Input n: 123

>> Answer Is:
121

**Example 02**

>> Please Input n: 34562

>> Answer Is:
34543

# Project 46: INTEGER TO ENGLISH WORDS — Hard

Convert a non-negative integer to its English words representation.
Given input is guaranteed to be less than 100.

**Example 01**

>> Please Input n: 89

>> Answer Is:
eighty nine

**Example 02**

>> Please Input n: 18

>> Answer Is:
eighteen

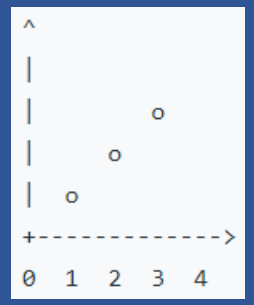
# Project 47: MAX POINTS ON A LINE — Hard

Given n points on a 2D plane, find the maximum number of points that lie on the same straight line.

**Example 01**

>> Please Input n: [1, 1; 2, 2; 3, 3]

>> Answer Is:
3




**Example 02**

>> Please Input n: [1, 1; 3, 2; 5, 3; 4, 1; 2, 3; 1, 4]

>> Answer Is:
4