2024 NCKU Program Designed I Midterm - Programming Test

Student ID: **Name:**

System Information:

- **Online Judge Link: http://140.116.154.71**
  - You can choose any operating system you want and access this link through a browser.

Before Start:

Please check your personal account and log into the online judge system.

Scoring:

Task	Name	Time Limits	Memory Limits	Points
A	**One Delete Operator of Palindrome**	**1s**	**256 MB**	**10**
B	**Sumikko Gurashi and Jumping**	**1s**	**256 MB**	**10**
C	**Goldbach's conjecture**	**1s**	**256 MB**	**10**
D	**Attention is all you need**	**1s**	**256 MB**	**10**

Judging result:

Result	Explanation
Correct	Your program passed all test cases.
Wrong Answer	Your program produced incorrect output for some test cases.
Run-Error	Your program encountered a memory error or an unexpected issue and was terminated by the system (ex. Segmentation Fault).
Compiler-Error	Your program failed to compile.
NO-Output	Your program produced no output.

Problem A. One Delete Operator of Palindrome - (10%)

Given a positive integer in which each digit is guaranteed to be non-zero, you can choose any one position and delete the digit at that position to obtain a new number. For example, if you delete the second position **(right to left)** in 1234, the new number would be 124. Our goal is to determine which positions can be deleted to make the new number a palindrome (回文).

A palindrome is defined as a number that reads the same from left to right as it does from right to left. For example, 1221 and 959 are palindromes.

Please design a program to output all positions that can be deleted, sorted in ascending order or report that is impossible.

Input Format:

number

Input Limies:

- $11 <= number <= 10^9$
- Each digit is guaranteed to be non-zero

Sample Testcase:

Sample Input 1	**Sample Output 1**
1234	**Impossible**
Sample Input 2	**Sample Output 2**
1221	**2 3**
Sample Input 3	**Sample Output 3**
12397321	**4 5**

Scoring Details:

Group	Number of tests	Points
Sample Testcase	3	1
Public Testcase	5	3
Private Testcase	10	6

You need to pass all tests of group, and you will get the points.

Problem B. Sumikko Gurashi and Jumping - (10%)

A shrimp is currently in a rice field (稻田) of length ***n***. We can imagine this rice field as ***n*** cells, where '.' represents an empty space, '+' represents a crop, and 'V' represents the current position of the shrimp.

The shrimp will make ***m*** jumps, and each time it jumps, it can choose to jump a certain number of cells to the left or to the right. If it lands on a cell containing a crop, that crop will be destroyed by the jump.

Please design a program that outputs the state of the rice field after each jump, line by line.

Note: It is possible for a jump to go out of the bounds of the grid. If a jump would exceed the range, you must report **"Out of range"** and ignore this operation.

Input Format:

n m

c_1 … c_n (c_i represents i-th of cell)

[L or R] number

.

. (total of m times)

.

[L or R] number

Input Limits:

- 1 <= ***n, m, number*** <= 10
- c_i = '+' | '-' | 'V'
- It is guaranteed that 'V' will definitely appear in c and that there will be only one instance of it.

Sample Testcase:

Sample Input 1	**Sample Output 1**
10 3 **…V……** **L 1** **R 1** **L 2**	**..V…….** **…V……** **.V……..**
Sample Input 2	**Sample Output 2**
1 4 **V** **L 1** **R 10** **L 3** **L 10**	**Out of range** **Out of range** **Out of range** **Out of range**
Sample Input 3	**Sample Output 3**
6 4 **.+++V.** **R 1** **L 2** **L 10** **L 2**	**.+++.V** **.++V..** **Out of range** **.V+...**

Scoring Details:

Group	Number of tests	Points
Sample Testcase	3	1
Public Testcase	5	3
Private Testcase	5	6

You need to pass all tests of group, and you will get the points.

Problem C. Goldbach's conjecture - (10%)

Goldbach's Conjecture (哥德巴赫猜想) is one of the unsolved problems in number theory. It proposes that any even integer greater than 2 can be expressed as the sum of two prime numbers (質數). Please design a program that, given an integer **n** greater than 2, outputs two prime numbers ***x*** and ***y*** such that ***x + y = n.*** **If there are multiple solutions, prioritize the one where *x* is smaller.**

As of 2014, mathematicians have verified even numbers up to 4×10^{18} *In all these verifications, no counterexamples (反例) to Goldbach's conjecture for even numbers have been found.*

Input Format:

n

Input Limits:

- 1 <= n <= 500 and must be an even number.

Sample Testcase:

Sample Input 1	Sample Output 1
44	**3 41**

Scoring Details:

Group	Number of tests	Points
Sample Testcase	1	1
Public Testcase	5	3
Private Testcase	10	6

You need to pass all tests of group, and you will get the points.

Problem D. Attention is all you need - (10%)

There are ***n*** people and ***n*** tasks. The attention level of the ***i-th person on the j-th task is represented by*** $a_{i,j}$. Given an ***n * n*** matrix, this matrix records the *"attention level"* of each person on each task. Your objective is to assign ***n*** people to ***n*** different tasks and design a program to calculate the optimal assignment (The sum of *attention level* is maximized).

Your program must output a sequence where the number at the **i-th position** indicates the person assigned to the **i-th task**.

Note: If there are multiple assignment methods that yield an optimal result, please prioritize outputting the assignment where the numbers on the left are as small as possible (如果有多種最佳答案, 請讓輸出的結果越左邊的數字是越小的).

Input Format:

n

a_{1,1} … a_{1,n}

.

.

.

a_{n,1} … a_{n,n}

Input Limits:

- $1 <= n <= 3$
- $1 <= |a_{i,j}| <= 10^6$

Sample Testcase:

Sample Input 1	Sample Output 1
3 **1 1 1** **1 1 5** **1 1 1**	**1 3 2**

Sample Input 2	Sample Output 2
2 **1 2** **4 2**	**2 1**
Sample Input 3	**Sample Output 3**
1 **-1000000**	**1**

Scoring Details:

Group	Number of tests	Points
Sample Testcase	3	1
Public Testcase	5	3
Private Testcase	10	6

You need to pass all tests of group, and you will get the points.