

# Homework 1 - Text Editor

Input file: `stdin`  
Output file: `stdout`  
Time limit: 2 seconds  
Memory limit: 256 megabytes

A little coder has decided to create his own text editor for programming purposes. He is going to use this text editor to write complex LISP programs, that's why one of the most important features of his editor should be paired parentheses highlighting. At the beginning his text editor needs to support the only operation - change a character at position  $i$ . And the editor doesn't allow texts longer than  $n$  characters. Every time when a new character is a opening or closing parenthesis his editor should highlight the corresponding closing or opening parenthesis. Let's define what does corresponding mean. Let position  $i$  in text has an opening parenthesis, then the corresponding parenthesis is a closing parenthesis at position  $j$ , for which the following is true:

$i < j$ ;

if we consider a text from positions  $i$  to  $j$  inclusive and remove all characters that are non-parentheses, then we will get a correct parentheses sequence.

$j$  is minimal among all  $j$ , satisfying the above conditions.

The same way we can define a parenthesis corresponding to the given closing parenthesis. Unfortunately, our little coder has some troubles implementing this functionality, so he asked you to help him. Your task is given a sequence of operations, for each operation to change a character to a parenthesis to find a position of a corresponding parenthesis if it exists.

## Input

First line contains  $n$  ( $1 \leq n \leq 100000$ ) — maximum length of text, and  $m$  ( $1 \leq m \leq 100000$ ) — the number of operations to modify text. The following  $m$  lines describes the operations, each change is presented as an integer value  $i$  - position of a modification and a new character (lowercase letters, numbers and parentheses). By default it is assumed that text contains "a" letters.

## Output

For each operation, which changes some character to a parenthesis you need to print a line containing the position of the corresponding opening or closing parenthesis. If no such parenthesis exists, print -1.

## Examples

stdin	stdout
3 4	-1
1 (	1
3 )	1
2 )	-1
3 )	
6 6	-1
2 m	6
3 a	
4 i	
5 l	
6 )	
1 (	