Problem B
Linked List

A linked list is one basic linear data structure which is usually taught in any *Data Structure* course in college. Despite its practicality (or impracticality) for real-life applications, it is often used to demonstrate a way to store data in a non-continuous storage.

Three common operations in a linked list are insertion, deletion, and searching. In this problem, you are going to deal with the fourth operation which may find its place in real-life applications, i.e. sliding. Supposed you are given a linked list with N integers which are sequentially linked from 1 to N ($1 \rightarrow 2 \rightarrow 3 \rightarrow \cdots \rightarrow N$). A slide operation involves two integers a and b, i.e. $\texttt{slide}(a, b)$, and it moves integer a from its position to the (immediate) right of b's position.

For example, let $N = 5$, thus, the initial linked list is $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$. The operation $\texttt{slide}(4, 1)$ will change the linked list into $1 \rightarrow 4 \rightarrow 2 \rightarrow 3 \rightarrow 5$, i.e. 4 is moved from its position to the immediate right of 1's position. In this case, 4 is moved *two* positions to the *left*. If another operation, $\texttt{slide}(1, 5)$, is performed, then the linked list becomes $4 \rightarrow 2 \rightarrow 3 \rightarrow 5 \rightarrow 1$, i.e. 1 is moved from its position to the immediate right of 5's position. In this case, 1 is moved *four* positions to the *right*.

Given a linked list with N integers from 1 to N (all integers are linked from 1 to N sequentially) and Q `slide` operations. For each $\texttt{slide}(a, b)$ operation, you should perform the sliding operation and output how far a is moved in the linked list. If a is moved to the left, then output it as the negative value (e.g., -2 in the above example); otherwise, output it as the non-negative value (e.g., 4 in the above example).

After all of the operations have been performed, you also need to output the final linked list.

Input

Input begins with two integers: N Q ($1 \leq N, Q \leq 100000$), representing the number of integers in the linked list and the number of operations, respectively. The next Q lines, each contains two integers: a b ($1 \leq a, b \leq N$; $a \neq b$), representing a $\texttt{slide}(a, b)$ operation to be performed.

Output

For each operation, output in a line how far the respected integer is moved. If the respected integer is moved to the left, output the negative value; otherwise, output the non-negative value. The last line of the output contains N integers (each separated by a single space) representing the linked list data after all operations have been performed.

Sample Input #1

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

Sample Output #1

```
-2
4
0
4 2 3 5 1
```

Explanation for the sample input/output #1

- initial: $1 \to 2 \to 3 \to 4 \to 5$.
- `slide`$(4, 1)$: $1 \to 4 \to 2 \to 3 \to 5$. The integer 4 is moved two positions to the left (output -2).
- `slide`$(1, 5)$: $4 \to 2 \to 3 \to 5 \to 1$. The integer 1 is moved four positions to the right (output 4).
- `slide`$(3, 2)$: $4 \to 2 \to 3 \to 5 \to 1$. The integer 3 is moved zero position (output 0).

Sample Input #2

```
3 4
1 2
2 3
3 1
1 3
```

Sample Output #2

```
1
2
0
1
3 1 2
```

Sample Input #3

```
10 2
2 7
10 7
```

Sample Output #3

```
5
-3
1 3 4 5 6 7 10 2 8 9
```