Rotate Puzzle

Christian has a ring puzzle with M slots arranged in a circle, numbered $0, 1, \ldots, M-1$ **clockwise**. Slot $M-1$ is adjacent to slot 0. Each slot holds a token with an integer value. Tokens are distinguished only by their values: tokens with equal values are interchangeable.

You are given S **sections**. A section with starting slot x and length ℓ contains the slots $x, (x+1) \bmod M, \ldots, (x+\ell-1) \bmod M$, in that order. Thus, a section may cross the boundary between slots $M-1$ and 0, and different sections may overlap.

A single **move** picks one section and rotates its current contents by exactly one step **clockwise**: the tokens currently sitting in that section's slots all shift forward by one slot (in the clockwise order of the section), and the token in the section's last slot moves to the section's first slot. Tokens outside the chosen section do not move. Every move rotates clockwise by one step; you may never rotate a section the other way.

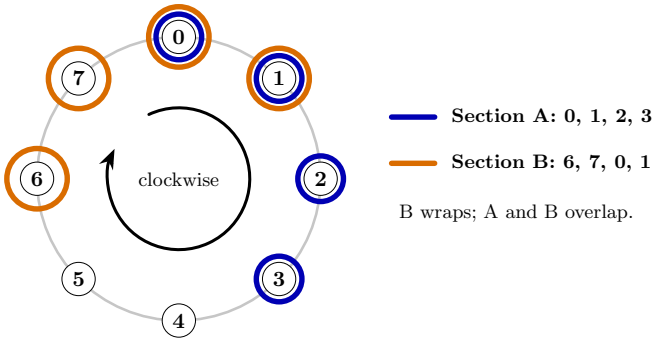


Figure 1: Two possible sections on an eight-slot ring. Section A contains slots $0, 1, 2, 3$. Section B contains slots $6, 7, 0, 1$, so it crosses from slot 7 to slot 0 and overlaps Section A at slots 0 and 1.

Christian may apply moves in any order, any number of times, choosing any section each time. Given a starting arrangement of token values and a target arrangement, determine the minimum number of moves he needs to turn the start into the target, or report that it is impossible.

Input

The first line contains two integers M and S: the number of slots and the number of sections, where $2 \le M \le 8$ and $1 \le S \le 8$.

The second line contains M integers $a_0, a_1, \ldots, a_{M-1}$: the starting token value in each slot, in slot order, where $0 \le a_i \le 10^9$.

The third line contains M integers $b_0, b_1, \ldots, b_{M-1}$: the target token value in each slot, in slot order, where $0 \le b_i \le 10^9$. The target values are not required to be a permutation of the starting values; if the two arrangements have different multisets of values, the target is impossible to reach.

Each of the next S lines contains two integers *start* and *len* describing a section, where $0 \le start \le M-1$ and $2 \le len \le M$.

Output

Output a single integer: the minimum number of moves to reach the target arrangement, or `-1` if it cannot be reached.

Sample Input 1

```
4 1
1 2 3 4
4 1 2 3
0 4
```

Sample Output 1

```
1
```

Sample Input 2

```
4 2
5 6 7 8
5 6 7 8
0 2
2 2
```

Sample Output 2

```
0
```

Sample Input 3

```
4 1
1 2 3 4
1 2 4 3
0 2
```

Sample Output 3

```
-1
```

Sample Input 4

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

Sample Output 4

```
1
```

Sample Input 5

```
2 1
7 7
7 8
0 2
```

Sample Output 5

```
-1
```

Sample Explanation

In the fourth sample, the section visits slots 4, 0, and 1, so it wraps across the boundary. Rotating it once changes the start into the target.

In the fifth sample, the starting arrangement contains two tokens with value 7, while the target contains values 7 and 8. Rotations cannot change token values, so the target is impossible to reach.