

Long Way to be Non-decreasing

Input file: **standard input**
Output file: **standard output**
Time limit: 4 seconds
Memory limit: 512 megabytes

Little R is a magician who likes non-decreasing arrays. She has an array of length n , initially as a_1, \dots, a_n , in which each element is an integer between $[1, m]$. She wants it to be non-decreasing, i.e., $a_1 \leq a_2 \leq \dots \leq a_n$.

To do this, she can perform several magic tricks. Little R has a fixed array $b_1 \dots b_m$ of length m . Formally, let's define a trick as a procedure that does the following things in order:

- Choose a set $S \subseteq \{1, 2, \dots, n\}$.
- For each $u \in S$, assign a_u with b_{a_u} .

Little R wonders how many tricks are needed at least to make the initial array non-decreasing. If it is not possible with any amount of tricks, print -1 instead.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \leq t \leq 10^4$). The description of the test cases follows.

The first line of each test case contains two integers n and m ($1 \leq n \leq 10^6$, $1 \leq m \leq 10^6$) — the length of the initial array and the range of the elements in the array.

The second line of each test case contains n integers a_1, \dots, a_n ($1 \leq a_i \leq m$) — the initial array.

The third line of each test case contains m integers b_1, \dots, b_m ($1 \leq b_i \leq m$) — the fixed magic array.

It is guaranteed that the sum of n over all test cases does not exceed 10^6 and the sum of m over all test cases does not exceed 10^6 .

Output

For each test case, output a single integer: the minimum number of tricks needed, or -1 if it is impossible to make a_1, \dots, a_n non-decreasing.

Example

standard input	standard output
3	3
5 8	-1
1 6 3 7 1	3
2 3 5 8 7 1 5 6	
3 3	
1 3 2	
2 1 3	
10 10	
2 8 5 4 8 4 1 5 10 10	
6 7 2 6 3 4 1 1 3 5	

Note

In the first case, the initial array a_1, \dots, a_n is $[1, 6, 3, 7, 1]$. You can choose S as follows:

- first trick: $S = [2, 4, 5]$, $a = [1, 1, 3, 5, 2]$;

- second trick: $S = [5]$, $a = [1, 1, 3, 5, 3]$;
- third trick: $S = [5]$, $a = [1, 1, 3, 5, 5]$.

So it is possible to make a_1, \dots, a_n non-decreasing using 3 tricks. It can be shown that this is the minimum possible amount of tricks.

In the second case, it is impossible to make a_1, \dots, a_n non-decreasing.