

Problem 1

We want to find the smallest area in a document where a specified set of words appear at least each given times. That is, the input contains a number of pairs (b, x) , where b is the identity of a word and x is the location in the document that the word identified by b appears.

For example, if the content of a document is "Tome Loves Jane as Jane Loves Tom" and we are interested in the words Tom and Jane then the document can be represented as follows (the identity of Tom is 1 and the identity of Jane is 2):

(1, 1) (2, 3) (2, 5) (1, 7)

A more complicated input might look like the following.

(1, 3) (2, 5) (1, 6) (1, 7) (1, 8) (3, 10) (1, 18) (1, 19) (3, 25) (2, 30)

In this example, we are interested in 3 different words (i.e., we ignore all other words in the document) and the word identified by 1 appears at locations 3, 6, 7, 8, 18, and 19 and the word identified by 2 appears at locations 5 and 30, and so on. You may assume that the pairs are given in the increasing order of x . Now assume that the word identified by 1 has to appear at least 2 times in the wanted area and the words identified by 2 and 3 have to appear at least once in the wanted area. One can see that the smallest area where all three words appear at least each specified times is from the 5th to the 10th locations and the size is $10 - 5 + 1 = 6$. (In the input, it might look like the area from the 18th to the 30th locations is smaller because it contains only 4 pairs, but if you consider the original document this is larger than the previous one.) As has been shown just now, the size of an area from location s to location t is defined to be $t - s + 1$.

Given an input as specified above, write a program that computes the size of the smallest area that contains all of the words appearing at least each specified times.

[Input]

The first line of the input file contains the number T of test cases in the file. In each test case, the first line has two integers N (the number of pairs, no more than 1,000,000) and K (the number of interested words, no more than 1,000). The words are identified by integers from 1 to K . The next K lines contain one positive integer each, specifying the least number of times that a word has to appear in an area, in the order of identity of words. The next N lines contain two integers each specifying a pair. The first integer is the identity of the word and the second one is the location of the appearance of the word. The N pairs are given in the

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increasing order of the location. The value of the locations are no larger than 5,000,000.

Because of the large size of the input files, it is likely required that the fastest I/O functions for the programming language of your choice to be used.

There are two kinds of inputs listed as follows.

- Small Set: $T \leq 100$, $1 \leq N \leq 5,000$, $1 \leq K \leq 100$
- Large Set: $T \leq 20$, $1 \leq N \leq 1,000,000$, $1 \leq K \leq 1,000$

[Output]

For each test case given, print one line containing the size of the smallest area matching the condition of the input. If there is no such area, then the line contains -1.

[I/O Example]

Input

```
2
10 3
2
1
1
1 3
2 5
1 6
1 7
1 8
3 10
1 18
1 19
3 25
2 30
3 2
2
1
1 1
2 3
2 5
```

Output

```
6
-1
```

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