

# NOI '22 P5 - Bubble Sort

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**Time limit:** 2.0s    **Memory limit:** 1G

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## Background

Recently, little Z has developed a strong interest in bubble sorting.

Here is the pseudocode for bubble sort:

```
Input: a sequence  $a[1..n]$  of length  $n$ 
Output: a result sorted from small to large
for  $i = 1$  to  $n$  do:
    for  $j = 1$  to  $n - 1$  do
        if ( $a[j] > a[j + 1]$ )
            Swap the values of  $a[j]$  and  $a[j + 1]$ 
```

The number of swaps in bubble sort is defined as the number of swaps performed during sorting, which is the number of times the sixth line of the above bubble sort pseudocode is executed. He wants to find a sequence with as few exchanges as possible.

## Task Description

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The sequences studied by little Z consists of non-negative integers. It is of length  $n$  and must satisfy  $m$  additional conditions.

The  $i$ -th condition is: the minimum of the numbers with indices in  $[L[i], R[i]]$ , namely  $a[L[i]], a[L[i] + 1], \dots, a[R[i]]$ , is exactly  $V[i]$ .

He knows that bubble sort often times out. So, he wants to know what is the minimum number of swaps for bubble sort among all sequences that satisfy the additional condition.

## Input Specification

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There are multiple sets of data in this question.

The first line of input contains a positive integer  $T$ .

For each set of data, the first row contains two positive integers  $n, m$ . Data guarantees  $1 \leq n, m \leq 10^6$ .

The next  $m$  lines, each with three non-negative integers  $L[i], R[i], V[i]$ , represent a set of additional conditions. Data guarantees  $1 \leq L[i] \leq R[i] \leq n, 0 \leq V[i] \leq 10^9$ .

## Output Specification

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The output is  $T$  lines in total, one integer per line.

For each set of data, if there are sequences that satisfy the  $m$  additional conditions, output the minimum number of exchanges in bubble sort among all the sequences that satisfy the additional conditions. If there is no sequence satisfying all

conditions, output  $-1$ .

## Sample Input 1

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```
1
3 2
1 1 2022
2 3 39
```

## Sample Output 1

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```
1
```

## Explanation for Sample Output 1

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The constraints for this set of data are  $a[1] = 2022$ ,  $\min\{a[2], a[3]\} = 39$ .

If  $a[2] = 39$ , and  $39 \leq a[3] < 2022$ , then the bubble sort has only the first round of swap operations. This round swaps  $a[1], a[2]$  and  $a[2], a[3]$ , and the total number of swaps is 2.

If  $a[2] = 39$ , and  $a[3] \geq 2022$ , the bubble sort has only the first round of exchange operations, this round only exchanges  $a[1], a[2]$ , and the total number of exchanges is 1.

If  $a[3] = 39$ , and  $39 < a[2] < 2022$ , the bubble sort algorithm swaps  $a[1], a[2]$  and  $a[2], a[3]$  in the first round and  $a[1], a[2]$  in the second round. The total number of swaps is 3.

If  $a[3] = 39$ , and  $a[2] \geq 2022$ , the bubble sort algorithm exchanges  $a[2], a[3]$  in the first round, and exchanges  $a[1], a[2]$  in the second round. The total number of swaps is 2.

Therefore, the minimum number of swaps is 1.

## Additional Samples

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Sample inputs and outputs can be found [here](#).

- Sample 2 ( `bubble2.in` and `bubble2.ans` ).
- Sample 3 ( `bubble3.in` and `bubble3.ans` ) corresponds to test cases 8-10.
- Sample 4 ( `bubble4.in` and `bubble4.ans` ) corresponds to test cases 13-14.
- Sample 5 ( `bubble5.in` and `bubble5.ans` ) corresponds to test cases 15-16.
- Sample 6 ( `bubble6.in` and `bubble6.ans` ) corresponds to test cases 23-25.

## Constraints

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There are 25 test cases in this question. All test points satisfy:  $1 \leq T \leq 1000, 1 \leq \sum n, \sum m \leq 10^6, 1 \leq L[i] \leq R[i] \leq n, 0 \leq V[i] \leq 10^9$ .

Case	Constraints	Special Property
1 - 4		$n, m \leq 7$ , all but 2 cases have $n, m \leq 5$
5 - 7	$n, m \leq 17$ , all but 3 cases have $n, m \leq 9$	A
8 - 10	$n, m \leq 100, \sum n^3, \sum m^4 \leq 4 \cdot 10^7$	
11, 12	$n, m \leq 2000, \sum n^2, \sum m^2 \leq 4 \cdot 10^7$	
13, 14		B
15, 16		C
17, 18		
19	$\sum n, \sum m \leq 10^6$	A
20		B
21, 22		C
23, 24, 25		

where  $\sum n, \sum m$  represent the sum of  $n$  and  $m$  of all test points, respectively.  $\sum n^2, \sum m^2, \sum n^3, \sum m^3$  meanings are similar.

- Special property A: For  $1 \leq i \leq m, 0 \leq V[i] \leq 1$ .
- Special property B:  $L[i] = R[i]$  for  $1 \leq i \leq m$ .
- Special property C: The input gives  $m$  intervals  $[L[i], R[i]]$  Pairs do not intersect.

## Hint

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Some of the test points in this question have a large amount of input. We recommend that you use the fast I/O.