TRAINING COMPETITION FOR THE BULGARIAN EXTENDED NATIONAL TEAM
Bankya, 20 June 2025
Group A

Task AT1. FLASHLIGHTS

⏳5 sec. 💾 1024 MB

We can represent the Stara Planina mountain (Balkan mountains) as a sequence of N peaks in a vertical plane. Let's simply call them "peaks". The peaks are numbered from 1 to N. Peak i has coordinates (i, h_i). The value h_i denotes the altitude of peak i. It is guaranteed that $h_1, h_2, \ldots, h_N$ form a permutation of the numbers $1, 2, \ldots, N$. For each i $(1 \leq i \leq N)$, peaks i and $i+1$ are connected by a line segment. Since we will be moving at night along the peaks, in order to reach any part of the mountain we must have at least one working flashlight. Fortunately, there are K flashlights available for purchase. For each j $(1 \leq j \leq K)$, flashlight j can be bought at peak p_j for c_j euro. Unfortunately, flashlight j works only when the current altitude is within the interval $[a_j; b_j]$. In other words, when the current altitude is strictly less than a_j or strictly greater than b_j, flashlight j does not work. Note that the flashlights do not break when they leave their range. For example, when the altitude exceeds b_j, flashlight j will stop working, but as soon as we return to altitude b_j, the flashlight will start working again.

If we are currently at peak p, we can perform one of the following three actions:

- We can buy one of the flashlights offered at peak p; this flashlight can be used until the end of the trip.
- If $p > 1$, we can walk to peak $p - 1$.
- If $p < N$, we can walk to peak $p + 1$.

We cannot move without having a working flashlight. Also, we can move between two adjacent peaks only if at every moment of the walk at least one of the flashlights we currently possess is working (it is not necessary for it to be the same flashlight during the entire movement). For example, suppose we are currently at a peak with altitude 4 and want to move to an adjacent peak with altitude 1. If we have flashlights that work in altitude ranges $[1; 3]$ and $[3; 4]$, then we will be able to successfully move from one peak to the other. However, if we have flashlights that only work in the ranges $[1; 1]$ and $[2; 5]$, then it will still be impossible to move between these two peaks, i.e., none of the flashlights will work at altitude 1.47.

We want to determine for each $1 \leq j \leq K$ whether, starting from peak p_j and purchasing flashlight j, we can traverse the entire mountain. The traversal is done by visiting each of the N peaks at least once and repeatedly performing one of the three actions described above. Write the program **`peaks`** that, given the data about the peaks in Stara Planina, answers these K questions by finding the minimum total amount of euro spent to traverse the mountain (this cost includes the initial purchase of flashlight j).

Input

The first line of the standard input contains the positive integers N and K – the number of mountain peaks and the number of flashlights available for purchase. The next line contains N numbers – $h_1, h_2, \ldots, h_N$. Each of the last K lines contains four numbers p_j, c_j, a_j, b_j, specifying that flashlight j can be bought at peak p_j for price c_j euro and has a range $[a_j; b_j]$.

Output

For each j, output the minimum cost to traverse the mountain if you start from peak p_j and purchase flashlight j, or -1 if it is not possible to traverse the mountain or h_{p_j} is not in the interval $[a_j; b_j]$.

Constraints

- $1 \leq N, K \leq 2000$;
- $h_1, h_2, \ldots, h_N$ form a permutation of the numbers from 1 to N;
- $1 \leq c_j \leq 10^6$;
- $1 \leq a_j \leq b_j \leq N$.

Subtasks

Subtask	Points	Required subtasks	N	K	Other constraints
0	0	—	—	—	The example test.
1	9	—	≤ 20	≤ 6	—
2	12	$0-1$	≤ 70	≤ 70	—
3	23	—	≤ 300	≤ 300	$h_i = i$
4	16	$0-3$	≤ 300	≤ 300	—
5	40	$0-4$	≤ 2000	≤ 2000	—

The points for a subtask are given only if all tests for it and the required subtasks are passed successfully.

Example

Input	Output	Explanation of the example
7 8 4 2 3 1 5 6 7 3 1 2 4 1 2 1 3 4 4 1 7 6 10 1 7 6 20 6 6 6 30 5 5 7 40 1 6 7 50 7 7	7 -1 4 10 30 -1 -1 -1	If we start by purchasing flashlight 1 at peak 3, we can perform the following sequence of actions: • walk left to peak 1; • buy flashlight 2; • walk right to peak 4; • buy flashlight 3; • walk right to peak 7. At this point, we have visited every peak at least once and have spent a total of $1 + 2 + 4 = 7$ euro. We cannot start by purchasing flashlight 2, 6, or 7, since they do not function at the altitude where they can be bought. Thus, the answer to each of the respective questions is -1. If we start by purchasing flashlight 3 or 4, we can visit all the peaks without buying additional flashlights. If we start by purchasing flashlight 5, we also need to buy flashlight 4 later. If we start by purchasing flashlight 8, we will remain at peak 7. Even if we purchase a flashlight at peak 7, we still will not be able to move from peak 7 to peak 6.