Two Antennas

There are N antennas, numbered from 1 to N along a line. Each antenna is one kilometer distant from consecutive antennas. The height of the antenna i ($1 \leq i \leq N$) is H_i. The antenna i can send information to the antennas located between A_i kilometers and B_i kilometers, inclusive, from the antenna i. If and only if the antenna x and the antenna y ($1 \leq x < y \leq N$) can send information to each other, the pair of antennas is in communication, and the communication cost is equal to $|H_x - H_y|$.

Mr. K, the Prime Minister of JOI Republic, has received Q complaints about bad connection from the citizens. A study showed that, for the j-th complaint ($1 \leq j \leq Q$), something among the antennas $L_j, L_j + 1, \ldots, R_j$ has troubles. You are assigned to find whether there exists a pair of antennas in communication among the antennas $L_j, L_j + 1, \ldots, R_j$, and if there does, you also have to find the maximum communication cost among such pairs.

Write a program which, given the information of antennas and complaints, determines whether there exists a pair of antennas in communication among the antennas $L_j, L_j + 1, \ldots, R_j$ and calculates the maximum communication cost among such pairs if there exists such a pair.

Input

Read the following data from the standard input. All the values in the input are integers.

N
$H_1\ A_1\ B_1$
$\vdots$
$H_N\ A_N\ B_N$
Q
$L_1\ R_1$
$\vdots$
$L_Q\ R_Q$

Output

Write Q lines to the standard output. The j-th line ($1 \leq j \leq Q$) should be -1 if there is no pair of antennas in communication among the antennas $L_j, L_j + 1, \ldots, R_j$, or the maximum communication cost among such pairs otherwise.

Constraints

- $2 \leq N \leq 200\,000$.
- $1 \leq H_i \leq 1\,000\,000\,000$ $(1 \leq i \leq N)$.
- $1 \leq A_i \leq B_i \leq N - 1$ $(1 \leq i \leq N)$.
- $1 \leq Q \leq 200\,000$.
- $1 \leq L_j < R_j \leq N$ $(1 \leq j \leq Q)$.

Subtasks

1. (2 points) $N \leq 300$, $Q \leq 300$.
2. (11 points) $N \leq 2\,000$.
3. (22 points) $Q = 1$, $L_1 = 1$, $R_1 = N$.
4. (65 points) No additional constraints.

Sample Input and Output

Sample Input 1	Sample Output 1
5 10 2 4 1 1 1 2 1 3 1 1 1 100 1 1 5 1 2 2 3 1 3 1 4 1 5	-1 1 8 8 99

The antenna 1 and the antenna 2 are not in communication, so the answer to the 1st complaint is -1.

The pair of antennas in communication which has the maximum communication cost for the 2nd, 3rd, 4th and 5th complaint is $(2, 3)$, $(1, 3)$, $(1, 3)$, and $(4, 5)$, respectively.

Sample Input 2	Sample Output 2
20 260055884 2 15 737689751 5 5 575359903 1 15 341907415 14 14 162026576 9 19 55126745 10 19 95712405 11 14 416027186 8 13 370819848 11 14 629309664 4 13 822713895 5 15 390716905 13 17 577166133 8 19 195931195 10 17 377030463 14 17 968486685 11 19 963040581 4 10 566835557 1 12 586336111 6 16 385865831 8 9 1 1 20	806460109

This sample input satisfies the constraints for Subtask 3.