Happy Alice

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3.5 seconds
Memory limit:	512 megabytes

Alice is an excellent doll maker with lots of dolls. She has n dolls, labelled from 1 to n. The color of the dolls is either red or black. Each doll also has a distinct value.

Every day, Alice chooses two dolls from the label range $[l, r]$ to perform a play. If she can find two dolls with labels i and j, such that 1) both doll i and doll j have the same color with their values $v_i < v_j$, and 2) there exists not a doll $k \in [l, r]$ in a different color with its value $v_i < v_k < v_j$, then Alice gets a score of $v_j - v_i$ for the play. Or she can do nothing and get a score of zero for the play.

Now Alice needs to maximize the score of the plays each day. Could you help her to calculate the maximum scores?

Input

The first line contains an integer n ($1 \le n \le 10^4$) — the number of dolls.

The next line contains n integers, the i-th of which is c_i ($c_i \in \{0, 1\}$) — the polar (1 for red and 0 for black) of doll i.

And the next line contains n integers, the i-th of which is v_i ($1 \le v_i \le 10^9$ and all v_i's are distinct) — the value of doll i.

Then the next line contains an integer m ($1 \le m \le 10^6$) — the number of days.

For the next m line, each line contains two numbers l_i and r_i ($1 \le l_i \le r_i \le n$) — the label range $[l_i, r_i]$ of the candidate dolls on day i.

Output

The output contains m lines with an integer in each line.

The integer in the i-th line is the maximum score Alice could get on day i.

Specifically, if Alice cannot find such dolls i and j, you should output 0.

Example

standard input	standard output
5 1 0 0 0 1 4 5 3 1 2 5 1 3 2 4 2 5 1 5 1 1	0 4 2 0 0

Note

Please use fast input and output.