Sweeping Robots

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 megabytes

There are n sweeping robots in a line, and the i-th robot from left to right has a cost c_i. It is guaranteed that all c_i's are distinct. The distance between the i-th robot and the $(i+1)$-th robot is d_i.

When you want to sweep the interval between the l-th robot and the r-th robot, you will first greedily choose the robot with the minimal cost in that interval. Then, the robot will find a path that covers every robot in that interval at least once, with a length as minimal as possible. Note that the robot does not need to return to the original place. Define the cost of interval $[l, r]$ as the cost of the selected robot multiplies the length of the selected path.

You need to answer q queries, and each query is as follow: for a given interval $[l, r]$, what is the maximal cost over intervals $[l', r']$ such that $l \leq l' \leq r' \leq r$?

Input

The first line consists of an integer n ($1 \leq n \leq 5 \times 10^5$).

The second line consists of n integers, the i-th of which is c_i ($1 \leq c_i \leq n$).

The third line consists of $n - 1$ integers, the i-th of which is d_i ($1 \leq d_i \leq 10^5$).

The fourth line consists of an integer q ($1 \leq q \leq 10^6$).

The next q lines describes the queries, and the i-th line contains two integers l_i and r_i ($1 \leq l_i \leq r_i \leq n$).

Output

The output is large, so you only need to print 1 integer — The XOR sum of the q integers, the i-th of which should be the answer for interval $[l_i, r_i]$.

Example

standard input	standard output
5 4 1 5 2 3 2 8 4 2 4 3 5 1 2 2 4 1 3	18