Problem D. Greedy Game

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

There are n items and two players. For each player and for each item, the value of the item for this player is known. Denote values of the i-th item for the first and the second player as a_i and b_i correspondingly.

Players take the items in turns. The first player starts the game. The first player is greedy: each turn, he chooses the item which has the maximal a_i among the remaining items. If there are several such items, he can take any one of them. What is the maximal possible sum of values b_i of items taken by the second player that he can guarantee regardless of the first player's moves?

Input

The first line contains a single integer $1 \le n \le 10^5$, the number of items.

The second line contains n numbers, i-th is equal to a_i, the value of the i-th item for the first player.

The third line contains n numbers, i-th is equal to b_i, the value of the i-th item for the second player.

All values are integers from 1 to 10^9.

Output

Output a single number: the maximal sum of values b_i of items taken by the second player that he can guarantee.

Example

standard input	standard output
5 1 2 3 4 5 2 3 4 5 6	8

Problem B. Lines

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	512 mebibytes

You are given n distinct points $a_1, \ldots, a_n$ on the plane. For each pair (i, j) $(i < j)$, consider the line passing through the points a_i and a_j (denote it as $L_{i,j}$). Let $A_{i,j}$ be the angle in radians from horizontal line to $L_{i,j}$ in counterclockwise direction. Note that, by definition, $0 \le A_{i,j} < \pi$.

Consider the array $p_1, p_2, \ldots, p_{\frac{n \cdot (n-1)}{2}}$ which contains the values $A_{i,j}$ in non-decreasing order. Your task is to find the median of p.

Recall that the median of the array of length x is its element with number $\lfloor \frac{x}{2} \rfloor + 1$ if x is odd, and the average of its elements with numbers $\lfloor \frac{x}{2} \rfloor$ and $\lfloor \frac{x}{2} \rfloor + 1$ otherwise.

Input

The first line of input contains a single integer n $(2 \le n \le 10^5)$, the number of points.

Next n lines contain the coordinates of the points: i-th of these lines contains two integers x_i and y_i $(-10^9 \le x_i, y_i \le 10^9)$, the coordinates of point a_i.

It is guaranteed that the points are distinct.

Output

Print the median of the angles with absolute or relative error at most 10^{-9}.

Examples

standard input	standard output
3 0 0 0 1 1 0	1.5707963268949
4 0 0 0 1 1 0 1 1	1.17809724517117
3 0 0 0 1000000000 1 0	1.5707963267949
3 0 0 1 0 2 0	0

Problem G. Youngling Tournament

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Yoda, the Grand Master of the Jedi Order, hit on the idea to hold a tournament among younglings. He has not chosen the date yet, but he has already decided on the format of the tournament.

There are N younglings studying in the Jedi Temple. Yoda can feel the Force inside younglings, moreover, he can represent the amount of the Force inside i-th youngling as the number f_i.

Therefore, the format of the tournament is the following. At first, Yoda makes the children stand in a row in order of non-increasing f_i. Then, the first youngling in the row competes against all the others united together. The combat is based on lightsaber battle and is very spectacular. However, Yoda knows that the result doesn't depend on anything but the Force inside competitors. The youngling wins if his amount of Force is not less than the total amount of the Force inside all his opponents. In that case, he is considered one of the winners. Otherwise, he loses. Anyway, after that he is removed from the row, and the tournament continues. Again, the strongest (first in the row) youngling competes against all the others standing in the row in the same format, if he wins, he is also considered one of the winners. After that he is removed and the tournament continues in the same format until there is only one child in the row. He becomes one of the winners automatically and the tournament finishes.

Yoda wants to know the total number of winners. However, as the tournament is postponed again and again, the amount of the Force inside the younglings changes from time to time. Help Yoda to compute the total number of winners after each change.

Input

The first line of input contains a single integer N, the number of younglings in the Jedi Temple ($1 \le N \le 100\,000$).

The second line contains N integers $f_1, f_2, \ldots, f_N$ the amount of the Force inside the younglings ($1 \le f_i \le 10^{12}$).

The third line of the input contains a single integer M, the number of changes in the Force amounts of students ($0 \le M \le 50\,000$).

The next M lines contain information about the changes. The i-th of these lines describes the i-th change and contains two integers k and f_k^*, which mean that the amount of the Force inside the k-th youngling becomes equal to f_k^* ($1 \le k \le N$, $1 \le f_k^* \le 10^{12}$).

Output

Print $M + 1$ lines, each of them containing a single integer.

On the first line, print the number of winners if the tournament was held before all the changes. On line $(i + 1)$ for all $i > 0$, print the number of winners if the tournament was held after the first i changes.

Examples

standard input	standard output
3 2 1 3 3 1 3 2 7 3 5	3 2 3 2
7 2 14 14 15 5 2 5 5 5 2 4 12 5 4 3 10 7 9	4 3 3 3 3 4

Problem M. Team Competition

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

N persons want to practice for an upcoming team competition. Snuke wants to schedule the practice. The schedule should satisfy the following conditions:

- The number of days of the practice is between 1 and N^2, inclusive.
- Each day, exactly three of N persons will participate in the practice.
- Let $f(p, q)$ be the number of days when both persons p and q will practice. The value $f(p, q)$ must be the same for all pairs of two distinct persons (p, q).

Input

Input consists of one integer N ($3 \leq N \leq 1000$).

Output

If no schedule that satisfies the conditions exists, print -1 in a single line.

Otherwise, print a schedule that satisfies the conditions in the following format. First line must contain the number of days K; i-th of the next K lines must contain the indices x_i, y_i, z_i of the three persons who practice on day i. The persons are numbered 1 through N. If there are several such schedules, print any one of them.

Example

standard input	standard output
5	10 1 2 3 1 2 4 1 2 5 1 3 4 1 3 5 1 4 5 2 3 4 2 3 5 2 4 5 3 4 5