Problem EX. Production line

Time limit 2000 ms
Memory limit 256MB

Problem Description

In the Kingdom, there are n factories, each characterized by a location x, a processing cost p, a greed factor k, and a product selling price s. To facilitate management, the ruler of the Kingdom, Bill, established upstream-downstream relationships among all factories. Each factory has one directly connected downstream factory. However, since you are Bill's closest friend, he did not establish a downstream relationship for your factory (making it the most downstream factory), allowing your products to be sold directly to consumers.

To determine the product selling price s, each factory i must select one factory j from among all its upstream factories (regardless of direct connections) to purchase its product as raw material. The purchase cost is s_j, the transportation cost is $(x_i - x_j)^2$, and the processing cost is p_i. The total cost is then multiplied by the greed factor k_i, so the product selling price s_i for factory i is given by:

$$s_i = k_i \cdot (s_j + (x_i - x_j)^2 + p_i)$$

If a factory i is the most upstream factory, since it has no upstream factory, we assume that its raw material cost and transportation cost are zero. Therefore, its product selling price s_i is given by:

$$s_i = k_i \cdot p_i$$

According to Bill's policy, the most downstream factory (which is your factory) always has the factory number 1. Each factory minimizes its selling price.

Bill wants you to calculate the minimum possible selling price for the product produced by your factory.

Input format

The first line contains an integer n — representing the number of factories.

The next $n-1$ lines each contain two integers a_i, b_i — indicating that factory b_i is a downstream factory of factory a_i.

The next line contains n integers x_i — representing the location of factory i.

The following line contains n integers p_i — representing the processing cost of factory i.

The last line contains n integers k_i — representing the greed factor of factory i.

- $1 \leq n \leq 2 \cdot 10^5$
- $\forall i \neq j,\ a_i \neq a_j$

- $a_i \neq 1,\ 1 \leq a_i,\ b_i \leq n$
- $-10^8 \leq x_i \leq 10^8$
- $1 \leq p_i \leq 10^8$
- $1 \leq k_i \leq 10$

Output format

Output a single integer a_1 — representing the minimum possible selling price of the product produced by your factory.

Subtask score

Subtask	Score	Additional Constraints
1	8	$n \leq 5 \times 10^3$
2	3	Each factory can have at most one upstream factory relationship, $x_i = 0$
3	15	Each factory can have at most one upstream factory relationship. If factory i is downstream of factory j, then $x_i \geq x_j$
4	20	Each factory can have at most one upstream factory relationship
5	4	$x_i = 0$
6	24	If factory i is downstream of factory j, then $x_i \geq x_j$
7	26	No additional constraints

Sample

Sample Input 1

```
5
4 1
5 4
2 5
3 2
-2 -1 4 2 -5
2 5 1 3 2
2 2 2 2 2
```

Sample Output 1

```
72
```

Sample Input 2

```
5
2 1
4 2
5 4
3 5
5 3 -5 3 -2
5 2 5 4 2
2 2 2 2 2
```

Sample Output 2

```
192
```

Sample Input 3

```
10
9 1
7 9
10 7
8 10
6 10
5 6
2 6
3 2
4 2
5 -3 -3 -4 4 -3 -3 -1 5 2
4 3 4 5 2 5 2 4 4 3
2 1 2 2 1 1 2 1 2 2
```

Sample Output 3

```
14
```

Notes