Problem H. Distance Sum

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	256 mebibytes

There are n cities and $n-1$ roads, and they form a tree. The cities are numbered 1 through n. The city 1 is the root, and for each i the parent of the city i is the city p_i, and the distance between i and p_i is d_i. Snuke wants to solve the following problem for each $1 \le k \le n$:

Compute the minimal possible sum of the distances from a certain city to the cities $1, \ldots, k$:

$$\min_{1 \le v \le n} \{\sum_{i=1}^{k} dist(i, v)\} \tag{2}$$

Here $dist(u, v)$ denotes the distance between cities u and v.

Input

First line of the input contains one integer n ($1 \le n \le 2 \cdot 10^5$). Then $n-1$ lines follow, i-th of them contains two integers p_{i+1} and d_{i+1} — parent of a city $i+1$ and the distance between $i+1$'th city and its parent ($1 \le p_i \le n$, $1 \le d_i \le 2 \cdot 10^5$, the graph represented by p_i is a tree).

Output

Print n lines. In the i-th line, print the answer when $k = i$.

Examples

<table>
<tr><th>standard input</th><th>standard output</th></tr>
<tr><td><pre>10
4 1
1 1
3 1
3 1
5 1
6 1
6 1
8 1
4 1</pre></td><td><pre>0
3
3
4
5
7
10
13
16
19</pre></td></tr>
<tr><td><pre>15
1 3
12 5
5 2
12 1
7 5
5 1
6 1
12 1
11 1
12 4
1 1
5 5
10 4
1 2</pre></td><td><pre>0
3
9
13
14
21
22
29
31
37
41
41
47
56
59</pre></td></tr>
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