

## Problem D. Flowers

Input file: *standard input*  
Output file: *standard output*  
Time limit: 8 seconds  
Memory limit: 512 mebibytes

We have planted  $N$  flower seeds, all of which come into different flowers. We want to make all the flowers come out together.

Each plant has a value called vitality, which is initially zero. Watering and spreading fertilizers cause changes on it, and the  $i$ -th plant will come into flower if its vitality is equal to or greater than  $th_i$ . Note that  $th_i$  may be negative because some flowers require no additional nutrition.

Watering effects on all the plants. Watering the plants with  $W$  liters of water changes the vitality of the  $i$ -th plant by  $W \times vw_i$  for all  $i$  ( $1 \leq i \leq n$ ), and costs  $W \times pw$  yen, where  $W$  need not be an integer.  $vw_i$  may be negative because some flowers hate water.

We have  $N$  kinds of fertilizers, and the  $i$ -th fertilizer effects only on the  $i$ -th plant. Spreading  $F_i$  kilograms of the  $i$ -th fertilizer changes the vitality of the  $i$ -th plant by  $F_i \times vf_i$ , and costs  $F_i \times pf_i$  yen, where  $F_i$  need not be an integer as well. Each fertilizer is specially made for the corresponding plant, therefore  $vf_i$  is guaranteed to be positive.

Of course, we also want to minimize the cost. Formally, our purpose is described as “to minimize  $W \times pw + \sum_{i=1}^N (F_i \times pf_i)$  under  $W \times vw_i + F_i \times vf_i \geq th_i$ ,  $W \geq 0$ , and  $F_i \geq 0$  for all  $i$  ( $1 \leq i \leq N$ )”. Your task is to calculate the minimum cost.

### Input

The input consists of multiple datasets. The number of datasets does not exceed 100, and the data size of the input does not exceed 20MB.

The first line of a dataset contains a single integer  $N$ , number of flower seeds. The second line of a dataset contains a single integer  $pw$ , cost of watering one liter. Each of the following  $N$  lines describes a flower. The  $i$ -th line contains four integers,  $vw_i$ ,  $pf_i$ ,  $vf_i$ , and  $th_i$ , separated by a space.

You can assume that  $1 \leq N \leq 10^5$ ,  $1 \leq pw \leq 100$ ,  $-100 \leq vw_i \leq 100$ ,  $1 \leq pf_i \leq 100$ ,  $1 \leq vf_i \leq 100$ , and  $-100 \leq th_i \leq 100$ .

The end of the input is indicated by a line containing a zero.

### Output

For each dataset, output a line containing the minimum cost to make all the flowers come out. The output must have an absolute or relative error at most  $10^{-4}$ .

## Examples

standard input	standard output
3	43.5
10	36
4 3 4 10	13.5
5 4 5 20	0
6 5 6 30	
3	
7	
-4 3 4 -10	
5 4 5 20	
6 5 6 30	
3	
1	
-4 3 4 -10	
-5 4 5 -20	
6 5 6 30	
3	
10	
-4 3 4 -10	
-5 4 5 -20	
-6 5 6 -30	
0	