Cecilia e l'orticoltura (`orticoltura`)

Cecilia is the most "environmentalist" team member in the OII, always attentive to respecting nature and sorting the trash. Naturally, she has a garden at home: a long, straight patch of soil, in which she planted N seeds. Each seed was planted at a specific distance X_i from the start of the garden and at a specific depth P_i. All these values are expressed in millimeters: the seeds are, however, always planted in positions that are multiple of 1cm for technical reasons (i.e. X_i and P_i are always divisible by 10).

To wet her seeds, Cecilia is going to install some sprinklers along the surface of her garden. These will spray water that, because of the soil's permeability, will reach the deep buried seeds. When a sprinkler is turned on, the sprayed water will spread along the surface with a speed of 1 millimeter per second both to the right and to the left. Each point, after becoming wet, will start expanding downwards into the soil at the same speed. This will form a triangle-shaped wet soil area:

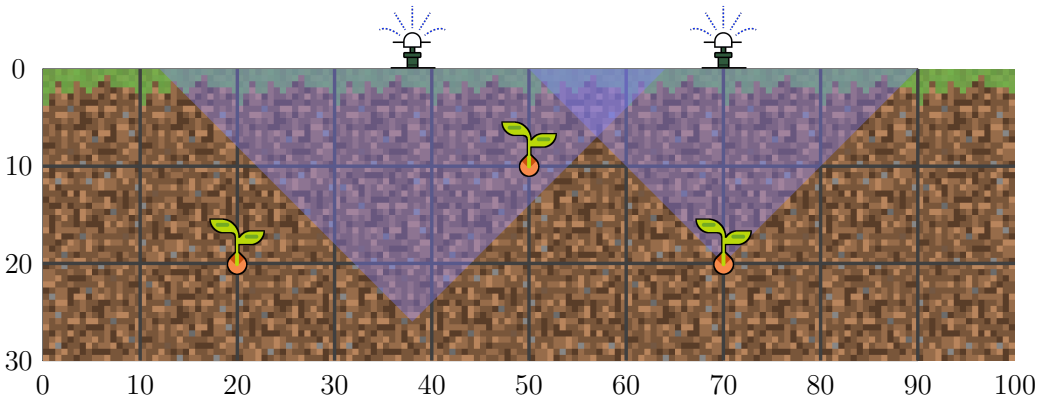


Figure 1: Two sprinklers located at 38mm and 70mm, turned on for 26 and 20 seconds respectively.

For example, in Figure 1 the two rightmost seeds are wet, but the leftmost seed is still dry. Notice that different sprinklers do not influence each other. More specifically, if we identify with (X_{seed}, P_{seed}) some seed's coordinates, with $X_{sprinkler}$ the position of a sprinkler and with $T_{sprinkler}$ its sprinkle duration, we can say that a seed is wet if:

$$|X_{seed} - X_{sprinkler}| + P_{seed} \leq T_{sprinkler}$$

Cecilia will sustain a fixed cost and a variable cost for each sprinkler. Buying a sprinkler is C euro cents, and using it costs 1 cent per second. The sprinklers can be scheduled to be on for different amounts of time, but the time must always be a multiple of 1 second. Moreover, each sprinkler must be installed at a distance from the start of the garden that is multiple of 1mm.

Help Cecilia buy, install and schedule the sprinklers so that all the seeds will be wet, while minimizing the total cost of the garden!

Implementation

You should submit a single file, with either a `.c` or `.cpp` extension.

> ☞ Among the attachments in this task you will find a template `orticoltura.c` or `orticoltura.cpp` with a sample implementation.

You will have to implement the following function:

C	`void irriga(int C, int N, int* X, int* P);`
C++	`void irriga(int C, int N, vector<int>& X, vector<int>& P);`

- The integer C is the fixed cost for each sprinkler installed.
- The integer N is the number of seeds planted in the garden.
- The array `X`, indexed from 0 to $N-1$, contains the list of seeds' positions.
- The array `P`, indexed from 0 to $N-1$, contains the list of seeds' depths.

Your program can use the following functions, which are already defined in the grader:

C/C++	`void posiziona(int D, int T);`

- The integer $D > 0$ is the position where to install a sprinkler.
- The integer $T > 0$ is how long the sprinkler will be on for.

C/C++	`void budget(int B);`

- The integer B is the minimum total cost that Cecilia should pay to wet all her seeds.

The grader will call the `irriga` function. From there, you will be able to call the function `posiziona` to install new sprinklers or call the `budget` function to return the total minimum cost to be paid. The order in which you will call the `posiziona` function is not important. In case of multiple calls to the `budget` function only the last one will be considered.

Sample grader

Among this task's attachments you will find a simplified version of the grader used during evaluation, which you can use to test your solutions locally. The sample grader reads data from `stdin`, calls the functions that you should implement and writes back on `stdout` using the following format.

The input file is formed by $N+1$ lines:

- Line 1: the integer C, the cost of a sprinkler.
- Line 2: the integer N, the number of seeds.
- Lines $3 \dots N+2$: the values of `X[`i`]` and `P[`i`]` for $i = 0 \dots N-1$.

The output file is formed by $K+2$ lines:

- Line 1: the integer B, the total cost found for the sprinklers.
- Line 2: the integer K, the number of sprinklers used.
- Lines $3 \dots K+2$: the values of `D[`j`]` and `T[`j`]` for $j = 0 \dots K-1$.

Constraints

- $0 \leq C \leq 10^9$.
- $1 \leq N \leq 1\,000\,000$.
- $10 \leq X_i, P_i \leq 10^9$ and they're multiples of 10, for each $i = 0 \dots N-1$.
- There are no two seeds at the same position and depth.

Scoring

Your program will be tested on a number of testcases grouped in subtasks. For each test case, the score is divided in two parts:

- 60% of the score: if the cost returned by `budget` is the minimum cost to wet all seeds;
- 40% of the score: if the calls to `posiziona` install the sprinklers in an optimal way.

The score for a subtask is given by the total points of the subtask, multiplied by the **minimum** score obtained on any of its testcases.

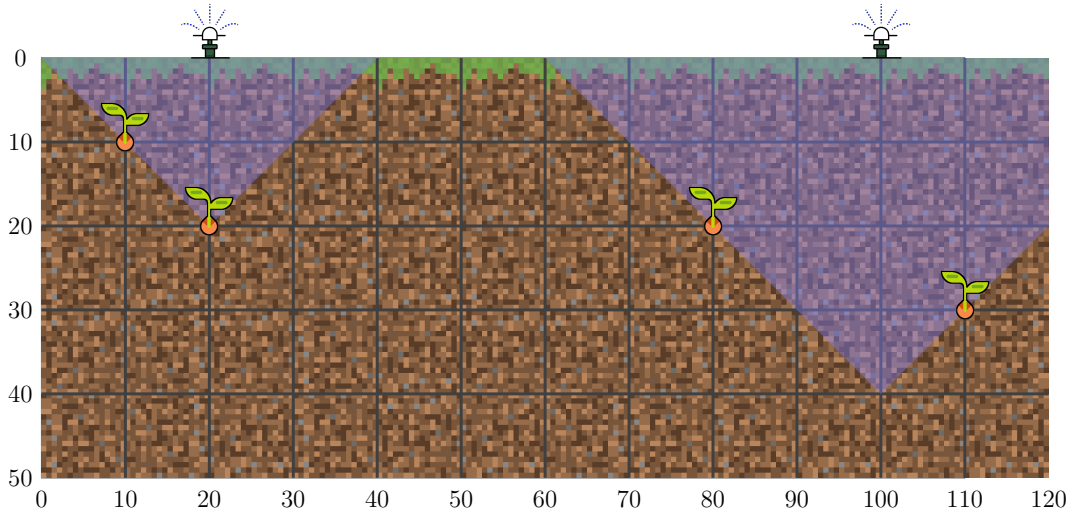
- **Subtask 1** [**0 points**]: Sample testcases.
- **Subtask 2** [**5 points**]: $N \leq 4$, $X_i \leq 100$, $P_i = 10$.
- **Subtask 3** [**15 points**]: $N \leq 1000$ e $P_i = 10$.
- **Subtask 4** [**20 points**]: $P_i = 10$.
- **Subtask 5** [**20 points**]: $N \leq 1000$.
- **Subtask 6** [**20 points**]: $C = 0$.
- **Subtask 7** [**20 points**]: No limits.

Examples

stdin	stdout
10 4 10 10 20 20 80 20 110 30	80 2 100 40 20 20
50 2 20 10 70 10	85 1 45 35

Explanation

In the **first sample testcase**, this is a possible solution:



In the **second sample testcase**, this is a possible solution: