ECE30018 Problem Solving Studio, Fall 2023

C10. Balloon

| Submission due: 9:00 PM, 24 Nov Fri

Balloon

To decorate a celebration party, we put n balloons along a horizontal line. The i-th balloon is attached to point x_i on the line. Every balloon is a sphere. The radius of a balloon grows continuously as air comes in. Initially, every balloon has no air, and thus, its radius is zero. You may assume that x_i is less than x_{i+1} for $1 \le i < n$.

We blow up the balloons, one by one, from the one at x_1 along the line. The i-th balloon increases in size until one of the following conditions is satisfied:

   - The i-th balloon touches one of the existing balloons.

   - The radius of i-th balloon reaches a given radius bound r_i.

Write a program that finds the radii of balloons, given their positions and radius bounds.

Requirements

Input data

- The first line from the standard input has an integer n, which represents that the number of balloons for $1 \leq n \leq 100{,}000$.

- Each of the remaining n lines has the location of a balloon and its radius bound. For example, the $(i+1)$-th line contains two numbers x_i and r_i where $0 \leq x_i \leq 10^9$ and $1 \leq r_i \leq 10^9$ for all i.

Output data

- Print out n real numbers to the standard output such that the i-th number represents the radius of the i-th balloon.

- Your program must return the answer within 1.0 second.

- Your answer for a radius will be regarded as correct if it is within 0.001 from the true value.
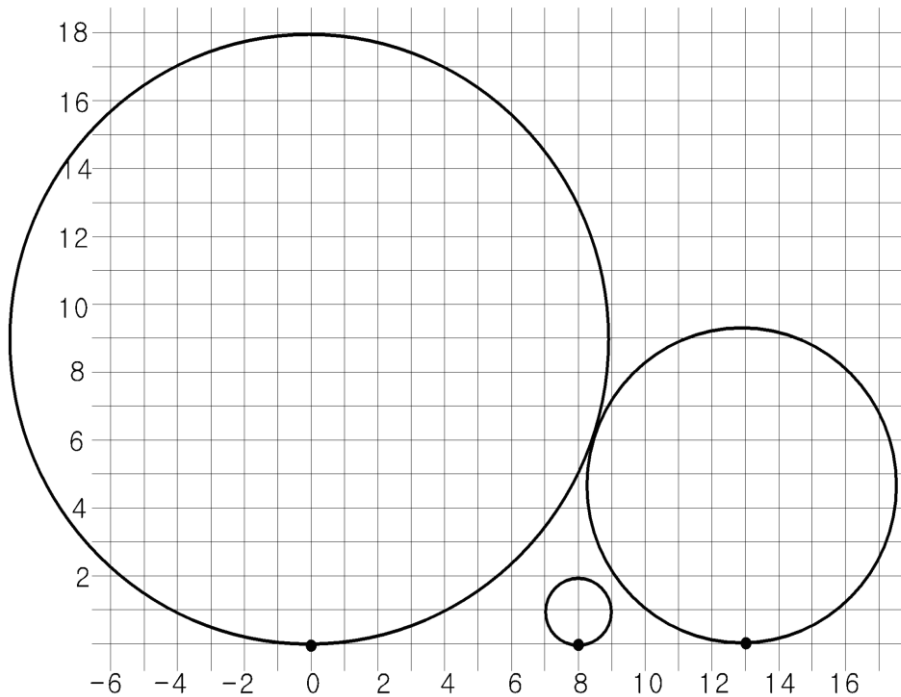
Example of test data

Input data

```
3
0 9
8 1
13 7
```

Output data

```
9.000
1.000
4.694
```

C10 Teams

Team No.	Members
1001	백건하, 나보림
1002	백하현, 이신원
1003	소병찬, 이준명
1004	오인혁, 강하림
1005	최정겸, 전혜림
1006	박민지, 유건민
1007	박세찬, 최소미
1008	이원빈, 최혜림