Necklace

There are **N** points marked on a surface, pair (x_i, y_i) is coordinates of a point number **i**. Let's call a *necklace* a set of **N** figures which fulfils the following rules.

- The figure **#i** consists of all such points (**x**, **y**) that $(x - x_i)^2 + (y - y_i)^2 \le r_i^2$, where $r_i \ge 0$.
- Figures **#i** and **#(i+1)** intersect ($1 \le i < N$).
- Figures *#1* and **#N** intersect.
- All the rest pairs of figures do not intersect.

Write a program which takes points and constructs a necklace.

Input

First line of input contains an integer **t** ($1 \le t \le 45$), equals to the number of testcases. Then descriptions of **t** testcases follow.

The first line of the description contains one integer number **N** ($2 \le N \le 100$). Each of the next **N** lines contains two real numbers x_i, y_i ($-1000 \le x_i, y_i \le 1000$), separated by one space. It is guaranteed that at least one necklace exists for each testcase.

Output

For each testcase your program should output exactly **N** lines. A line **#i** should contain real number r_i ($0 \le r_i < 10000$). To avoid potential accuracy problems, a checking program uses the following rules.

- Figures **#i** and **#j** definitely do not intersect if $r_i + r_j \le d_{ij} - 10^{-5}$.
- Figures **#i** and **#j** definitely intersect if $d_{ij} + 10^{-5} \le r_i + r_j$.
- The case when $d_{ij} - 10^{-5} < r_i + r_j < d_{ij} + 10^{-5}$ is decided in favour of a contestant.
- d_{ij} equals $sqrt((x_i - x_j)^2 + (y_i - y_j)^2)$ in the rules above.

Example

Input:
```
1
4
0 0
10 0
10 10
0 10
```

Output:
```
7
7
7
7
```