Necklace

There are **N** points marked on a surface, pair ($\mathbf{x_i}$, $\mathbf{y_i}$) 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 $(\mathbf{x} - \mathbf{x_i})^2 + (\mathbf{y} - \mathbf{y_i})^2 \le \mathbf{r_i}^2$, where $\mathbf{r_i} \ge 0$.
- Figures **#i** and **#(i+1)** intersect ($1 \le \mathbf{i} < \mathbf{N}$).
- 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** ($1 \le \mathbf{t} \le 45$), equals to the number of testcases. Then descriptions of **t** testcases follow.

The first line of the description contains one integer number **N** ($2 \le \mathbf{N} \le 100$). Each of the next **N** lines contains two real numbers $\mathbf{x_i}$, $\mathbf{y_i}$ ($-1000 \le \mathbf{x_i}, \mathbf{y_i} \le 1000$), 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 $\mathbf{r_i}$ ($0 \le \mathbf{r_i} < 10000$). To avoid potential accuracy problems, a checking program uses the following rules.

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

Example

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

Output:
7
7
7
7