Hamiltonian Path Remix

The Mafia team is reviewing the problem proposals for a certain ICPC contest. One of the proposed problem statement goes as follows:

> Hamiltonian Path
>
> You are given a complete weighted undirected graph consisting of n vertices, numbered from 1 to n. The distance between vertex i and vertex j is denoted by $w_{i,j}$.
> A *Hamiltonian path* in this graph is a path that visits every vertex exactly once. The **length** of such a path is the sum of weights of all edges used along the path.
> Your task is to find the shortest Hamiltonian path (i.e. one with minimum possible total length).
> Formally, find a permutation $p_1, p_2, \ldots, p_n$ of $\{1, 2, \ldots, n\}$ that minimizes $\sum_{i=1}^{n-1} w_{p_i,p_{i+1}}$.

"But wait, isn't this problem too classical?" — thinks Quang, a member of *The Mafia* team.

After playing around with the idea of Hamiltonian path, he came up with the following variant of the problem. In this variant, the locations of the vertices are the vertices of a 2D convex polygon listed in counter-clockwise order, and the distance between vertex i and vertex j equals the Euclidean distance between the two vertices.

This variant turns out to be interesting enough (and hopefully, has not appeared in any other programming contest) and is accepted by the team, which goes on to be the problem H of that contest. As talented participants, can you solve it?

Input

Each test contains multiple test cases. The first line contains the number of test cases τ ($1 \le \tau \le 1\,000$). The description of the test cases follows.

- The first line contains an integer n ($3 \le n \le 3\,000$) — the number of vertices.
- The i-th of the next n lines contains two integers x_i and y_i ($0 \le x_i, y_i \le 10^6$) — the coordinates of the i-th vertex.

It is guaranteed that

- The vertex coordinates correspond to the vertices of a convex polygon listed in counter-clockwise order.
- No three consecutive vertices lie on the same line.
- The sum of n over all test cases does not exceed $3\,000$.

Output

For each test case, print n integers $p_1, p_2, \ldots, p_n$ — the indices of vertices on the shortest Hamiltonian path. The sequence p must be a permutation of $\{1, 2, \ldots, n\}$.

Your answer is considered correct if the absolute or relative error between the total length of your path and jury's path does not exceed 10^{-6}.

Formally, let the total length of your path be P, and the total length of jury's path be J. Your answer is accepted if and only if $\frac{|P-J|}{\max(1,|J|)} \le 10^{-6}$.

If there are multiple solutions, you can output any of them.

Sample Input 1

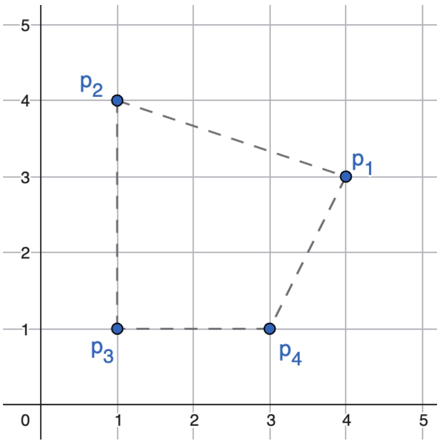
```
2
4
4 3
1 4
1 1
3 1
8
2 4
1 3
1 2
2 1
3 1
4 2
4 3
3 4
```

Sample Output 1

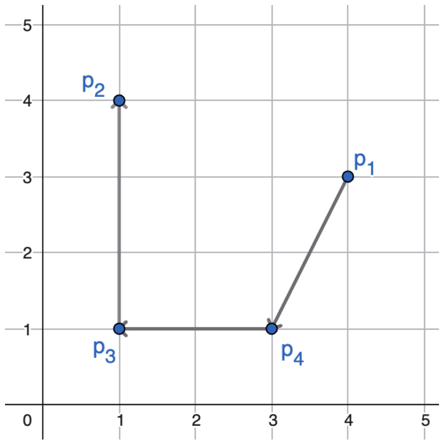
```
1 4 3 2
8 1 2 3 4 5 6 7
```

Sample Explanation

Illustration of the first test case:

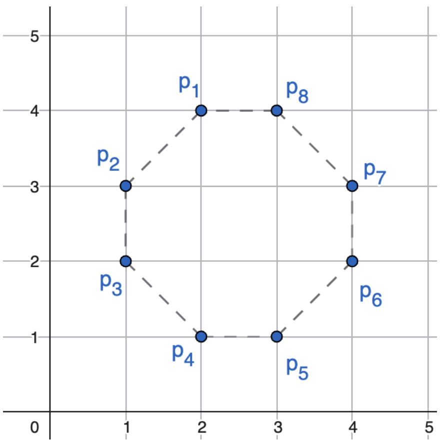


Location of vertices

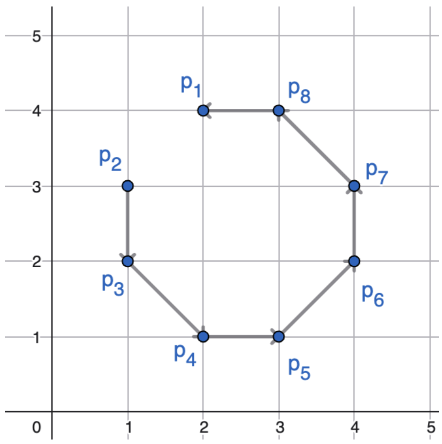


A possible shortest Hamiltonian path (total length: $\sqrt{5} + 2 + 3 \approx 7.236$)

Illustration of the second test case:



Location of vertices



A possible shortest Hamiltonian path (total length $4 \times 1 + 3 \times \sqrt{2} \approx 8.243$)