[I2A] - Vector Sorting

Time: 1 sec / Memory: 256 MB

Background

This problem simulates the vector sorting step used in the Graham-Scan algorithm for the Convex Hull (/@LTYI96fQQOWFYWr2vFQsWg/BJwPiYf3A) problem.

You may use the method developed in Compare function for Vector Sorting (/@LTYI96fQQOWFYWr2vFQsWg/SktY-cSh0) as a building block for this problem.

Problem Statement

Given n distinct points $p_1 = (x_1, y_1), p_2 = (x_2, y_2), \ldots, p_n = (x_n, y_n)$ in the plane, first select a reference point p_i for some $1 \leq i \leq n$ such that

> the angle spanned by the vectors $v_k := v_i\vec{v}_k$ for all $k \neq i$ is strictly less than π.

Sort the vectors v_k for all $1 \leq k \leq n$ in counter-clockwise order with ties broken by the length of the vectors in non-descending order.

Hint: Use `long long` data-type to prevent integer overflow.

Input

The first line contains an integer n, where $1 \leq n \leq 10^5$.
The following n lines each contain two integers representing the coordinates of each point.

You may assume that the input points are distinct.

Output

Output the indexes of the vectors v_k in their sorted order.

Note that, according to the sorting rule, the first index will be the index of the reference point you select.

Example

Input:

```
4
0 0
15 15
15 -15
20 0
```

Output:

```
1 3 4 2
```