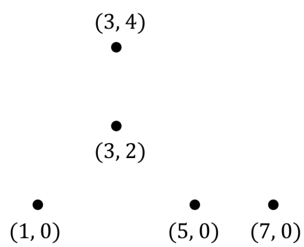
Problem H

Convex Hull

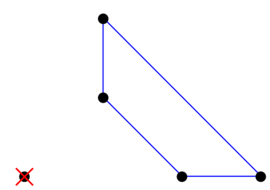
A convex-hull of a set of 2-dimensional points P is defined as the polygon with the smallest perimeter that encloses all points in P. It is "convex" because such a polygon will always have a convex shape.

You are given a set P that contains N points. For each point $(x_i, y_i) \in P$, you should output the number of points in $P \setminus \{(x_i, y_i)\}$ that lies exactly at the convex-hull enclosing all points in $P \setminus \{(x_i, y_i)\}$. Note that the notation $P \setminus \{(x_i, y_i)\}$ means that the point (x_i, y_i) is taken out from set P. In other words, the i^{th} point is taken out from P when the convex-hull in consideration is built. Also note that the constructed convex-hull can also degenerate into a line or a point depends on the set of points in consideration.

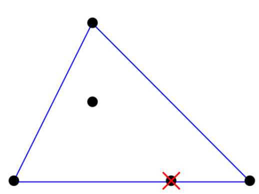
Consider the following example. Let there be $N = 5$ points: $(1, 0)$, $(5, 0)$, $(7, 0)$, $(3, 4)$, and $(3, 2)$.



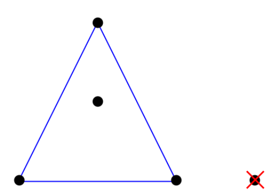
The set of all points P.



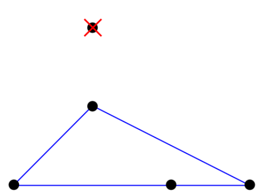
The convex-hull when $P_1 = (1, 0)$ is removed. There are 4 points that lies at the convex-hull.



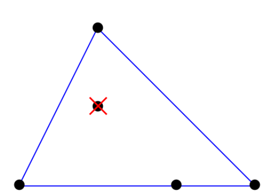
The convex-hull when $P_2 = (5, 0)$ is removed. There are 3 points that lies at the convex-hull.



The convex-hull when $P_3 = (7, 0)$ is removed. There are 3 points that lies at the convex-hull.



The convex-hull when $P_4 = (3, 4)$ is removed. There are 4 points that lies at the convex-hull.



The convex-hull when $P_5 = (3, 2)$ is removed. There are 4 points that lies at the convex-hull.

Input

Input begins with a line containing an integer N ($2 \le N \le 100\,000$) representing the number of points in the set P. The next N lines each contains two integers x_i y_i ($-10^9 \le x_i, y_i \le 10^9$) representing the (x, y) coordinate of the i^{th} point. You are guaranteed that there are no two points located at the same coordinate.

Output

Output contains N lines. The i^{th} line contains an integer representing the number of points in $P \setminus \{(x_i, y_i)\}$ that lies exactly at the convex-hull of $P \setminus \{(x_i, y_i)\}$.

Sample Input #1

```
5
1 0
5 0
7 0
3 4
3 2
```

Sample Output #1

```
4
3
3
4
4
```

Explanation for the sample input/output #1

This is the example from the problem description.

Sample Input #2

```
3
0 0
0 100
100 0
```

Sample Output #2

```
2
2
2
```