

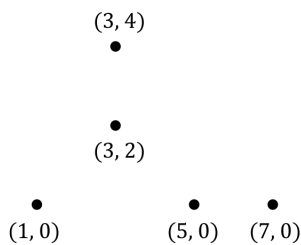
## Problem H

### Convex Hull

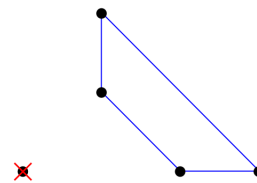
A convex-hull of a set of 2-dimensional points  $P$  is defined as the polygon with the smallest perimeter that encloses all points in  $P$ . It is “convex” because such a polygon will always have a convex shape.

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.

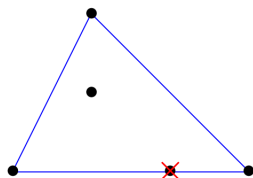
Consider the following example. Let there be  $N = 5$  points:  $(1, 0)$ ,  $(5, 0)$ ,  $(7, 0)$ ,  $(3, 4)$ , and  $(3, 2)$ .



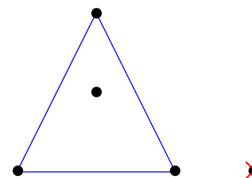
The set of all points  $P$ .



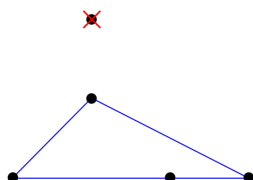
The convex-hull when  $P_1 = (1, 0)$  is removed. There are 4 points that lies at the convex-hull.



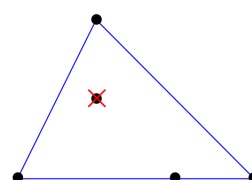
The convex-hull when  $P_2 = (5, 0)$  is removed. There are 3 points that lies at the convex-hull.



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  $N$  ( $2 \leq N \leq 100\,000$ ) representing the number of points in the set  $P$ . The next  $N$  lines each contains two integers  $x_i$   $y_i$  ( $-10^9 \leq x_i, y_i \leq 10^9$ ) 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
```