IOI Training Camp 2017
Team Selection Tests, Day 1

Convex Hull Count

You are given N points on a 2D plane. Let the set of points be $P = \{P_1, P_2, \ldots, P_N\}$. It is guaranteed that no three of them are collinear.

The *Score* of a point P_i, is the number of subsets S of P, such that $|S| \geq 3$ and P_i lies on the boundary of the convex hull of S (that is, it should be a corner in the convex hull). Obviously, P_i has to be part of any such S.

You have to output the *Score* of each point.

Input

The first line contains exactly one integer N, the number of points.
The i-th of the next N lines contains a pair of integers x_i and y_i, denoting the coordinates of P_i.

Output

Output N lines, the i-th of which should contain the *Score* of P_i. The answers should be outputted modulo $10^9 + 7$.

General Constraints

Unless otherwise mentioned, the following constraints are met throughout all subtasks:

- $1 \leq N \leq 2000$
- $-10^9 \leq x_i, y_i \leq 10^9$
- No three points are collinear

Subtasks

Subtask 1 (10 Points):

- $1 \leq N \leq 20$

Subtask 2 (15 Points):

- $1 \leq N \leq 100$

Subtask 3 (25 Points):

- $1 \leq N \leq 500$

Subtask 4 (50 Points):

- Original constraints.

Sample Input 1

```
4
0 0
1 1
1 2
2 0
```

Sample Output 1

```
4
3
4
4
```

Explanation

P_1 is on the boundary of the convex hull of 4 different subsets: $\{P_1, P_2, P_3\}, \{P_1, P_2, P_4\}, \{P_1, P_3, P_4\}$, and $\{P_1, P_2, P_3, P_4\}$. But P_2 lies on the boundary of the convex hull of only 3 subsets: $\{P_1, P_2, P_3\}, \{P_1, P_2, P_4\}$, and $\{P_2, P_3, P_4\}$. $\{P_1, P_2, P_3, P_4\}$ does not contain P_2 on the boundary of its convex hull.

Limits

Time: 2 seconds

Memory: 256 MB