Convex Hull Game

Description

Alice and Bob are play games again!

Today they are playing with convex hulls. The rule is: Given a set of N points on the two-dimensional space. Both of them choose a subset with at least 3 points from the set and find the convex hull from the subset. The player with larger perimeter of convex hull is the winner! Yes, this is a game with purely luck, but Alice and Bob still love this game.

One day, they wonder that if they randomly choose a subset with 3 points or more from the given set, what is the expectation of the perimeter of the convex hull? The term "randomly" indicates that every subset with 3 points or more shares equal probability to be chosen.

A convex hull of a set of points is the polygon with minimum perimeter that covers all the points.

Input

The first line contains an integer T indicating the total number of test cases. For each test case, the first line contains a integer N. For the next N line, each line contains 2 integers x, y indicating a point in the set.

- $1 \leq T \leq 100$
- $3 \leq N \leq 2000$
- $-10^6 \leq x, y \leq 10^6$
- For at least 95% of the testing data, $N \leq 100$
- It is guaranteed that there's no 3 points stay on the same line.

Output

For each test case please output a real number indicating the expectation of the perimeter of convex hull. Every answer with relative error less than 10^{-6} will be accepted.

Sample Input

```
2
4
0 0
1 1
0 1
1 0
4
0 0
0 3
3 0
1 1
```

Sample Output

```
3.5313708499
8.5001242192
```