Code: AREA | Problem 5 | Score: 100

Area Of A Polygon

Problem:

Gagandeep likes coordinate geometry very much. He is always busy solving problems involving graphs, loci, intersections etc. So today he has a problem for all of you. The problem is as follows:

"Given an ordered set of points containing the coordinates of the vertices of a polygon, can you find its area?"

Input:

The first line of each case will be n, n being the number of vertices.

Then n lines will follow, each line containing the X and Y coordinates of the point, separated by space.

All the coordinates will be integers.

Output:

There will be four lines of output, each line containing the area of the polygon.

Sample:

Input:

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

Output:

```
1
```

Explanation:

For a given ordered set of coordinates of the vertices of a polygon, its area is given by the formula:

$$\begin{aligned}\mathbf{A} &= \frac{1}{2}\left|\sum_{i=1}^{n-1} x_i y_{i+1} + x_n y_1 - \sum_{i=1}^{n-1} x_{i+1} y_i - x_1 y_n\right| \\ &= \frac{1}{2}|x_1 y_2 + x_2 y_3 + \cdots + x_{n-1} y_n + x_n y_1 - x_2 y_1 - x_3 y_2 - \cdots - x_n y_{n-1} - x_1 y_n|\end{aligned}$$

Where:

- A is the area of the polygon,
- n is the number of sides of the polygon, and
- (x_i, y_i), $i = 1, 2 \ldots n$ are the vertices of the polygon.

Scoring:

There are 2 test cases, each correct test case will fetch you 50 points.