Polygon

Time limit: *1000 ms*
Memory limit: *256 MB*

You are given a simple planar polygon in the 3-dimensional space. Find how many lattice points lie in the polygon's interior. A lattice point is a point that has integer Cartesian coordinates. That is, if the point is at (x, y, z), then x, y, z are all integers. Do not count lattice points on the polygon's boundary.

Standard input

The first line contains a single integer T, the number of test cases.

Each test case contains a single integer N on the first line, the number of vertices of the polygon. The next N lines each have a triplet of integers x_i, y_i, z_i which represent the X, Y, and Z coordinates of a vertex.

Standard output

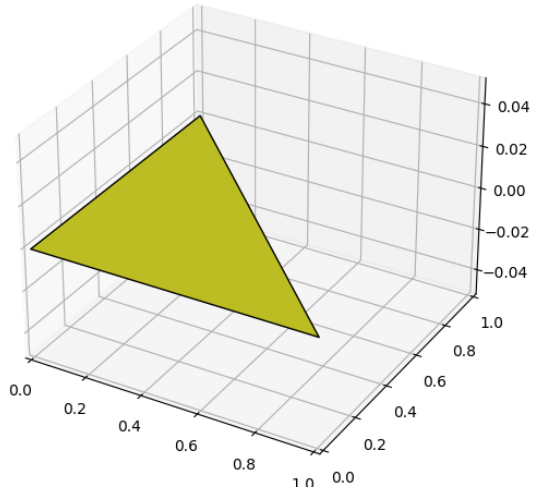
For each test case, output the number of interior lattice points in the polygon on a single line.

Constraints and notes

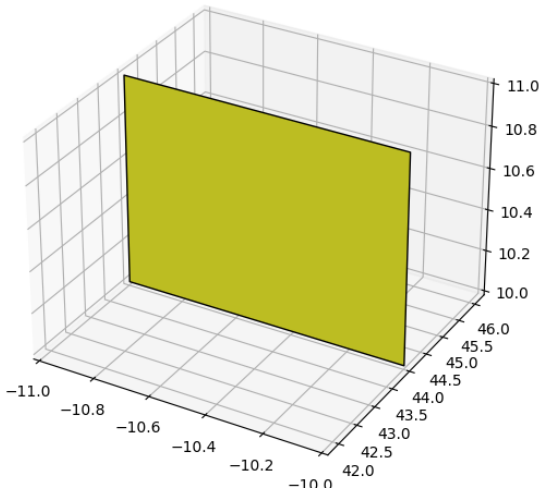
- $1 \le T \le 10$
- $3 \le N \le 10^3$
- $10^{-9} \le x_i, y_i, z_i \le 10^9$
- The input vertices are given in the order of walking the polygon edges.
- The polygon is planar: it lies in a 2D plane.
- The polygon is simple: its edges have no intersection except that adjacent edges share a vertex.
- The polygon is non-degenerate: It has non-zero area.

Input	Output	Explanation
3 3 0 0 0 0 1 0 1 0 0 4 -10 44 10 -10 44 11 -11 44 11 -11 44 10 4 4 4 3 12 4 9	0 0 2	There are three test cases: • Case 1: The polygon is a smallest right triangle in XY plane, which does not have any interior lattice point.

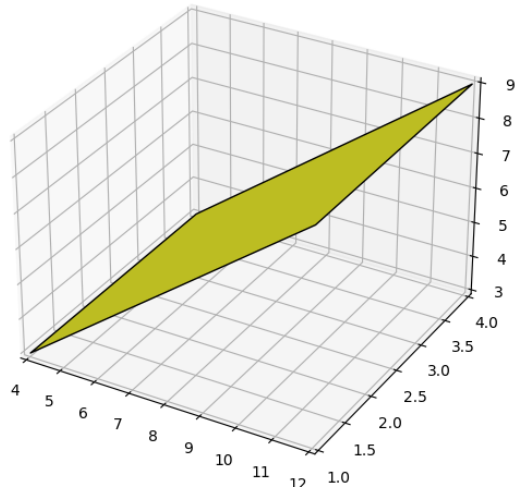
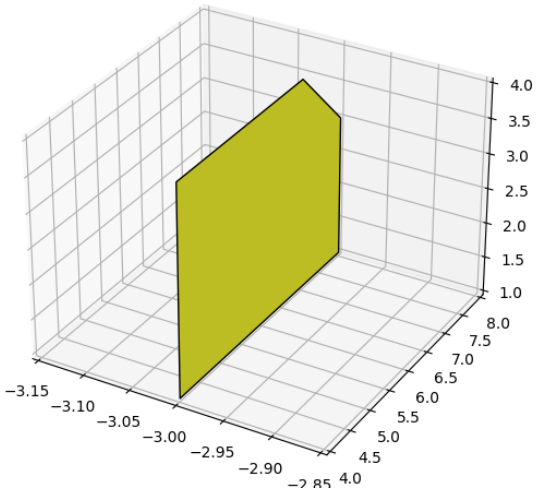
Input	Output	Explanation
12 1 9 4 1 3		

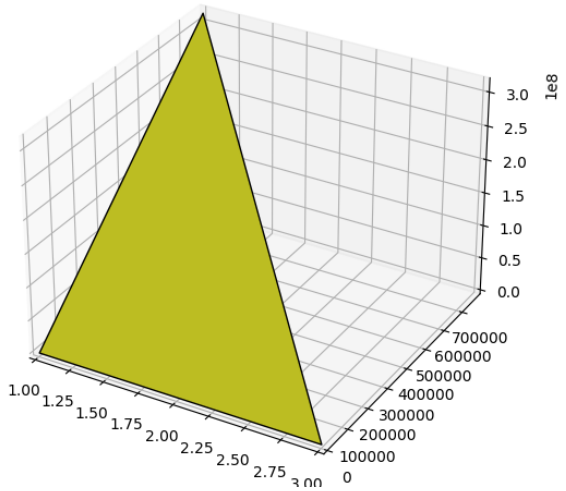
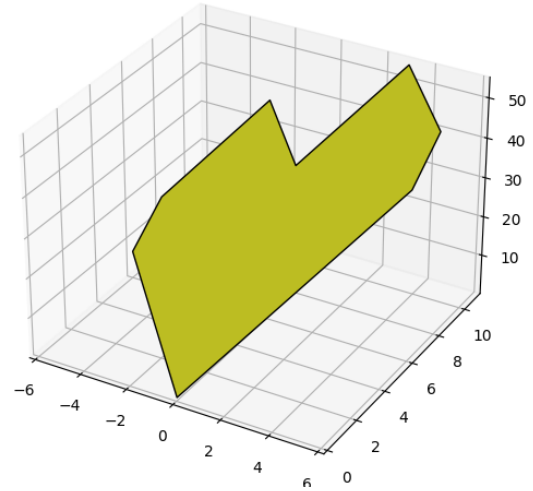


- Case 2: The polygon is a smallest square in a plane parallel to the XZ plane, which also does not have any interior lattice point.

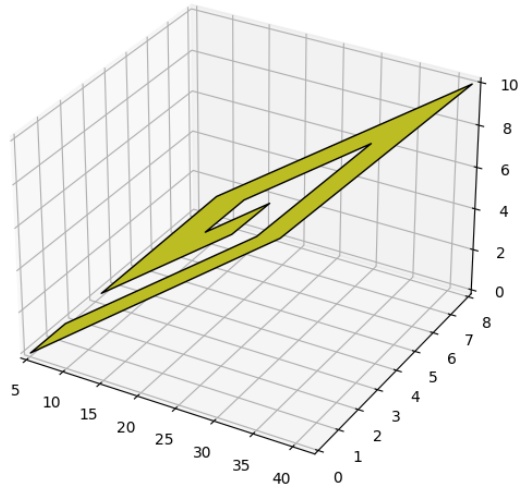


- Case 3: The polygon is a 3×10 rectangle on an inclined plane. It has 2 (2×1) interior lattice points.

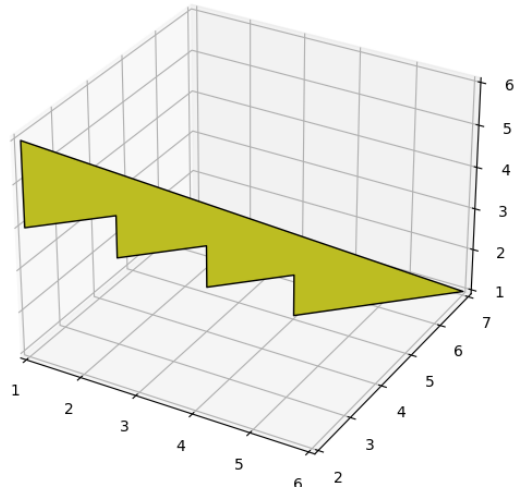
Input	Output	Explanation
		
3 5 -3 4 4 -3 7 4 -3 8 3 -3 8 1 -3 4 1 3 1 0 0 1 785300 314159265 3 0 0 8 0 0 1 6 6 43 6 8 51 3 11 54 0 8 33 -3 11 36 -6 8 15 -6 6 7	6 19632 65	• Case 1: The polygon is a 4×3 rectangle on a plane parallel to YZ plane, but with one trimmed corner. It has 6 (2×3) interior lattice points.  • Case 2: The polygon is a very tall triangle. Only the bottom half contains interior lattice points - one per line.

Input	Output	Explanation
3 12 5 0 0 10 0 2 19 6 2 34 6 8 28 2 8 23 2 6 26 4 6 21 4 4 15 0 4 30 0 10 42 8 10 17 8 0 9 1 2 6 1 2 4	14 0 9	 • Case 3: The polygon is a heart shaped non-convex polygon with 65 interior lattice points.  • Case 1: The polygon is a spiral with 14 interior lattice points. Note that there are 6 lattice points within the convex hull of the shape that are outside the polygon.

Input	Output	Explanation
2 3 4 2 3 3 3 4 3 3 4 2 4 5 2 4 5 1 6 7 1 5 1 1 2 1 3 4 1 5 6 5 5 10 5 1 6		



- Case 2: The polygon is a staircase with no interior lattice points.



- Case 3: The polygon is a degenerate pentagon - actually a square with 9interior lattice points.

Input	Output	Explanation