

Problem 9.

Peter Kagey

Given an $n \times n$ grid, consider all the ways that convex polygons with grid points as vertices can be nested.

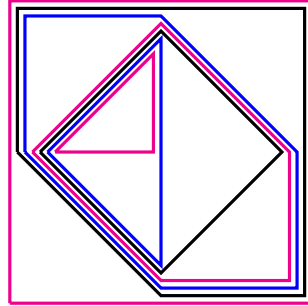


Figure 1: Seven nested convex polygons in the 3×3 grid.

Question. If we think of each polygon having the same height, what is the greatest volume that we can make by stacking the polygons this way?

Related.

1. What is the largest sum of the perimeters? The least?
2. What is the largest sum of the number of vertices? The least?
3. How many ways are there to stack $n^2 - 2$ polygons like this? Any number of polygons?
4. Does this generalize to polyhedra in the $n \times n \times n$ cube?
5. Does this generalize to polygons on a triangular grid?