

Contributed Talk: The area generating functions for left-lifted and left-grounded column-convex polyominoes

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A *cell* is a unit square whose vertices lie in the xy -plane and have integer coordinates. A *column* is a one-unit-wide, finite and connected union of cells. A *column-convex polyomino* is a finite, edge-connected union of columns, where no two columns have the same horizontal projection. A column-convex polyomino is *left-lifted* (respectively *left-grounded*) if the minimum ordinate of the leftmost column is greater or equal (respectively less or equal) than the minimum ordinate of any other column.

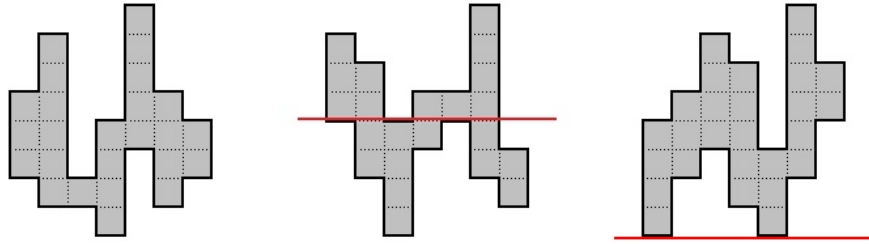


Figure 1: From left to right: A column-convex polyomino, a left-lifted column-convex polyomino and a left-grounded column-convex polyomino.

By convention, two column-convex polyominoes are different if and only if there does not exist a translation that maps one of them to the other. Let S be a family of column-convex polyominoes. By the area generating function of S , we mean the formal power series $\sum_{i,j=1}^{\infty} a_{ij} q^i x^j$, where a_{ij} is the cardinality of the set $\{P \in S : P \text{ has } i \text{ cells and } j \text{ columns}\}$.

The area generating function for all column-convex polyominoes is well-known (it is a rational function). On the other hand, left-lifted and left-grounded column-convex polyominoes have not been studied before now. Hence their area generating functions are new. The area gf of the left-lifted model is algebraic and satisfies a quadratic equation. The area gf of the left-grounded model is a complicated q -series.