Tromino

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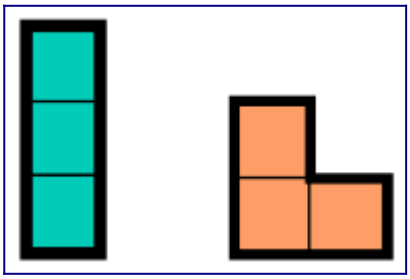
This article is about the geometric shape. For the game similar to dominoes, see Trominoes.



All possible free trominos

A **tromino** is a polyomino of order 3, that is, a polygon in the plane made of three equal-sized squares connected edge-to-edge.[1]

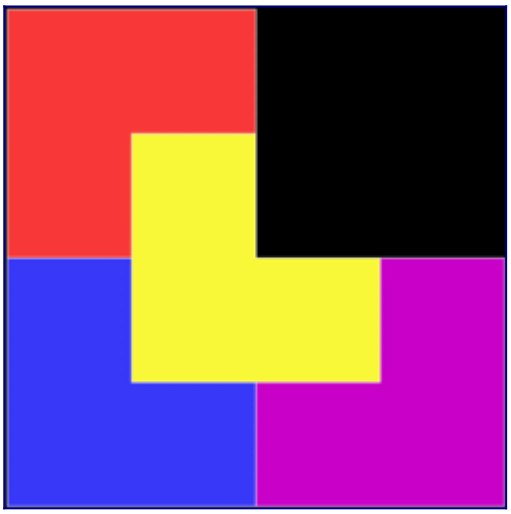
Contents

Symmetry and enumeration

When rotations and reflections are not considered to be distinct shapes, there are only two different *free* trominoes: "I" and "L" (the "L" shape is also called "V").

Since both free trominoes have reflection symmetry, they are also the only two *one-sided* trominoes (trominoes with reflections considered distinct). When rotations are also considered distinct, there are six *fixed* trominoes: two I and four L shapes. They can be obtained by rotating the above forms by 90°, 180° and 270°.[2][3]

Rep-tiling and Golomb's tromino theorem



Geometrical dissection of an L-tromino (rep-4)

Both types of tromino can be dissected into n^2 smaller trominos of the same type, for any integer $n > 1$. That is, they are rep-tiles.[4] Continuing this dissection recursively leads to a tiling of the plane, which in many cases is an aperiodic tiling. In this context, the L-tromino is called a *chair*, and its tiling by recursive subdivision into four smaller L-trominos is called the chair tiling.[5]

Motivated by the mutilated chessboard problem, Solomon W. Golomb used this tiling as the basis for what has become known as Golomb's tromino theorem: if any square is removed from a $2^n \times 2^n$ chessboard, the remaining board can be completely covered with L-trominoes. To prove this by mathematical induction, partition the board into a quarter-board of size $2^{n-1} \times 2^{n-1}$ that contains the removed square, and a large tromino formed by the other three quarter-boards. The tromino can be recursively dissected into unit trominoes, and a dissection of the quarter-board with one square removed follows by the induction hypothesis. In contrast, when a chessboard of this size has one square removed, it is not always possible to cover the remaining squares by I-trominoes.[6]

References

1.

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- *Weisstein, Eric W. "Triomino". MathWorld.*
- *Redelmeier, D. Hugh (1981). "Counting polyominoes: yet another attack". Discrete Mathematics. **36**: 191–203. doi:10.1016/0012-365X(81)90237-5.*
- *Nițică, Viorel (2003), "Rep-tiles revisited", MASS selecta, Providence, RI: American Mathematical Society, pp. 205–217, MR 2027179.*
- *Robinson, E. Arthur, Jr. (1999). "On the table and the chair". Indagationes Mathematicae. **10** (4): 581–599. doi:10.1016/S0019-3577(00)87911-2. MR 1820555..*

6. *Golomb, S. W. (1954). "Checker boards and polyominoes". American Mathematical Monthly. **61**: 675–682. doi:10.2307/2307321. MR 0067055..*

External links

- Golomb's inductive proof of a tromino theorem at cut-the-knot
- Tromino Puzzle at cut-the-knot
- Interactive Tromino Puzzle at Amherst College

- **v**
- **t**
- **e**

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