Pentomino Pathfinding

Steven Nguyen (icecream17)

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1 Introduction

[Dec24] posed the following problem: Given a rectangular $n \times m$ grid of squares, place a subset of the twelve pentominoes (see Figure 1), and endpoints A and B on the grid without overlaps such that $\#^p_{n,m}$ = the length of (the shortest nonempty path between A and B) is maximized.

The above notation is for the length of a particular path p; for the maximum such path, the notation is $\#_{n,m}$, and when $n = m$, the notation is $\#_n$.

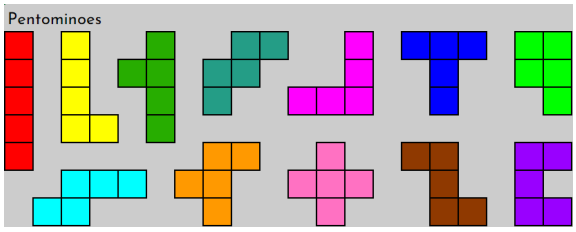
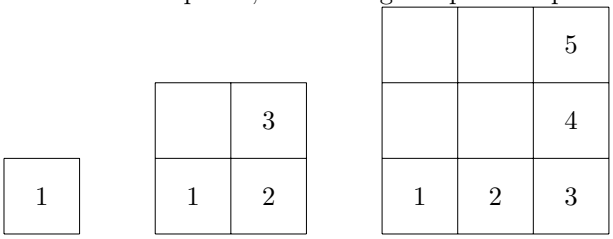


Figure 1: The twelve pentominoes [Com24]; from top left clockwise they are named I, L, Y, W, V, T, P, U, Z, X, F, N

2 Trivial solutions

2.1 No pentominoes

For $n = 1$ and 2, $n \times n < 5$, so no pentomino can fit: $\#_1 = 1, \#_2 = 3$. For $n = 3$, 9 squares minus a pentomino is 4 squares, so the length 5 path is optimal: $\#_3 = 5$.



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References

[Com24] Community. *Pentomino Pathfinding*. Sept. 3, 2024. URL: https://docs.google.com/spreadsheets/d/1NrbqWmnBLMtHH253q_v89bMYSuoPE7hDFr8g5VTbGMI/edit.

[Dec24] Deckard. *Pentomino Facts*. Aug. 2, 2024. URL: https://youtu.be/LPDAzHpSyAo?t=700.