Gabe McKay
Weicheng Li
Duran Suma

ECS 122A
October 8, 2025

Homework 1

Problem 3

Hypothesis: Given any board, 2^k x 2^k, with one tile missing/already filled. Every tile can be filled by placing some rotated version of an L piece without having any two tiles overlap or go outside of the board.

Base Case:

$k = 1$ is a 2x2 board, with one spot missing. It can be solved trivially with one L piece.

Assume:

$\forall p < k$, the 2^p x 2^p board, is possible to cover the entire board with L pieces.

Consider:

A 2^k x 2^k board. We divide and conquer by going into all 4 sub-quadrants, splitting up the board into 4 equally sized sub-quadrants. We continue this until we reach all 2x2 sub-quadrants, from here, we fill the trivial sub-quadrant with a spot missing. Now we can consider this sub-quadrant to be itself a missing spot, and all other recursive calls can back out a step. From here every 2x2 grid can be treated as a 1x1 grid. This means we now have a 2^{k-1} x 2^{k-1} grid with a single spot missing.
Wrap Up: This proves our hypothesis, since we assumed that a board of size $k - 1$ x $k - 1$ must follow our hypothesis.