Gabe McKay
Weicheng Li
Duran Suma

Homework 1

ECS 122A
October 9, 2025

Problem 3

Inductive 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.

Base Case:

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

Inductive step:

Assume the inductive hypothesis is true for some case when $k \geq 1$. We have a board with dimension of 2^{k+1} x 2^{k+1} which is $2 * 2^k$ x $2 * 2^k = 4 * 2^k$ x 2^k so that in this case the board with dimension of 2^{k+1} x 2^{k+1} could be considered as a combination of four 2^k x 2^k boards and by out inductive hypothesis implies 2^k x 2^k can be filled by placing some rotated version of L pieces so in the case of 2^{k+1} x 2^{k+1} dimension board conforms to our inductive hypothesis.

wrap up:

By the steps above, we have proved that when $k \in \mathbb{Z} \wedge k \geq 1$ 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.