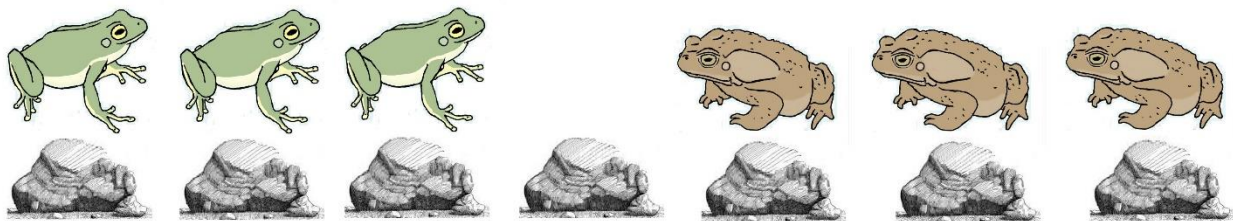


Chapel Hill Math Circle

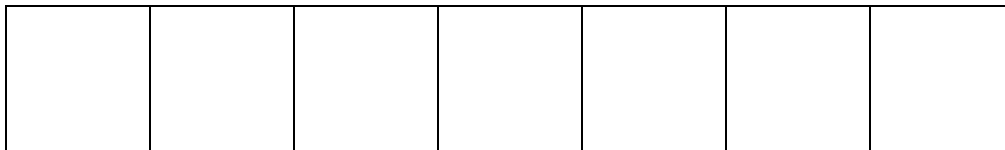
Intermediate Group

Toads and Frogs¹ November 19, 2016

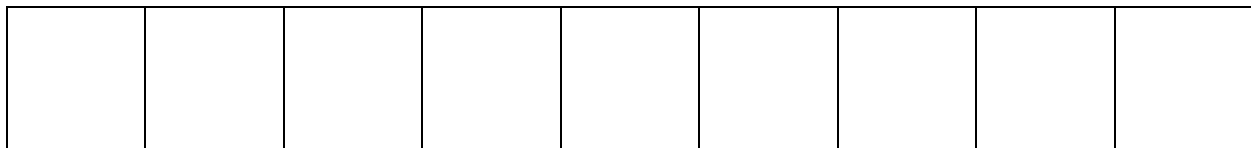
1. There are three frogs and three toads resting on rocks. The toads and the frogs would like to exchange places, but they must follow two rules.
 - a. They can only move forward.
 - b. They can move to an empty rock immediately in front or jump over at most one other amphibian to reach an empty rock.



You may want to let the 1 x 7 grid below represent the rocks. Use pennies to represent the amphibians (one side for toads and the other for frogs).



2. Try with a different number of rocks and make a conjecture about how many moves it'll take to do it with four toads and four frogs on nine rocks.



3. What is the number of moves if you have $2n + 1$ rocks, where n is the number of frogs (or toads)? Can you prove it?

¹ This puzzle was invented by Richard Guy. It first appeared in Berlekamp, Conway, and Guy's *Winning Ways for your Mathematical Plays*.