

Homework Day #37
COMP 2230
Spring 2024
Prof. Stucki

- 1) Review, if necessary, how Pascal's Triangle, aka Binomial Coefficients, work. Then perform the following:
 - a) Compute, by hand, the first 16 rows of Pascal's Triangle (keep in mind that the 16th row has 5-digit numbers, so make sure you leave enough space for that).
 - b) Now make a new triangle that is the triangle from part (a) mod 2. In other words, if an entry in Pascal's Triangle is even then this triangle will have a 0 in the same location, otherwise it will have a 1.
 - c) What did this produce? How is this connected to Cellular Automata?
- 2) What are the replacements for Rule 30? List out all 8 T-shaped patterns.
- 3) Hand trace the next 5 generations that Rule 30 would produce on this initial state: 10110111 (assume that each generation is producing an 8-bit string & the outside neighbors of each end point are 0)
- 4) Starting Conway's Game of Life with a blank world except for a single glider in it, compute the next 4 generations, showing how the glider moves.
- 5) If there are only 256 possible 2-color 1D CAs in which the rules only look at immediate neighbors, how many of the following can there be?
 - a) 2-color 1D CA which takes into account neighbors up to 2 cells away
 - b) 3-color 1D CA that only looks at immediate neighbors
 - c) n-color 1D CA which takes into account neighbors up to k cells away
 - d) 2-color 2D CA which takes 8 neighbors into account (Conway's Game of Life is one of these)