

MATH 113: DISCRETE STRUCTURES
MONDAY WEEK 4 HANDOUT

Problem 1. The first diagonal in Pascal's triangle is the constant sequence of 1's. The second diagonal is the sequence of positive integers $1, 2, 3, \dots$. What is the third diagonal? The fourth? The n -th?

Problem 2. You proved in your homework that $n^2 = \binom{n}{2} + \binom{n+1}{2}$. Where do these terms appear in Pascal's triangle? Use your "third diagonal" interpretation from Problem 1 to produce a new proof of this identity.

Problem 3. How many odd numbers are there in the 2018-th row of Pascal's triangle? (To answer this, you may as well find a general formula for the number of odd numbers in the n -th row of Pascal's triangle. [*Hint:* How many odd numbers in the 2^k -th row?])

