

MATH 113: DISCRETE STRUCTURES
FRIDAY WEEK 3 HANDOUT

Problem 1. Use algebra and the binomial theorem to prove that

$$\binom{2n}{n} = \sum_{k=0}^n \binom{n}{k}^2.$$

Problem 2. Use a combinatorial argument and an algebraic argument to produce two proofs of the identity

$$\sum_{k=0}^n \binom{n}{k} \binom{k}{m} = \binom{n}{m} 2^{n-m}.$$

[*Hint for the algebraic case:* First prove that $\binom{n}{k} \binom{k}{m} = \binom{n}{m} \binom{n-m}{k-m}$.]