MATH 113: DISCRETE STRUCTURES
HOMEWORK 31

Problem 1. What is the remainder of 10^{100} upon division by 13?

Problem 2. Consider a regular p-gon, and for fixed k (with $1 \leq k \leq p-1$), consider all k-subsets (subsets with k elements) of all of its vertices. Define an equivalence relation on the set of k-subsets: two k-subsets are equivalent if one can be rotated into the other one.

(a) Prove that if p is prime, then each equivalence class has exactly p elements.
(b) Show by an example that (a) is not true if p is not prime.
(c) Use (a) to prove that p divides $\binom{p}{k}$.