Math 218: Elementary Number Theory

Homework 11 Supplemental Problems

Blue problem below should be done without consulting your classmates. You are still encouraged to ask Hung and I about them, though!

1. What are the last two digits of the ordinary decimal form of 3^{404}?

2. Suppose you toss a 6-sided dice 10 times and record the number on the top of the dice each time. Use Inclusion-Exclusion to determine the number of ways those dice could be thrown so that each of the 6 numbers occur at least once in your list of 10 numbers. Here we assume tossing a 1 and then nine 6's is different than tossing nine 6's first and then a 1.

3. Use Inclusion-Exclusion to determine the number of permutations of the set $\{1, 2, \ldots, 9\}$ in which at least one odd integer is fixed.

   Recall a permutation is an arrangement of a list of n elements, so for $n = 3$ the 6 permutations are: $1, 2, 3$ $1, 3, 2$ $2, 1, 3$ $2, 3, 1$ $3, 1, 2$ $3, 2, 1$.

   Here we say $1, 2, 3$ and $1, 3, 2$ both fix 1, while $1, 2, 3$ and $3, 2, 1$ both fix 2.