Sample Number Theory Problems

These problems are just for your personal practice- no need to complete this or turn this in.

See `http://courses.csail.mit.edu/6.857/2006/handouts/H06-ps3sup.pdf` for an even more complete list of problems.

Problem -1. Gcd with Negative numbers Carefully examine the definition of Gcd to see how to deal with negative nubmers.

(a) What is the $\gcd(-9, 12)$?

(b) What is the $\gcd(-a, a)$? What is the $\gcd(a, a)$, when a can be positive or negative?

Problem -2. Euclid's Algorithm

(a) Find the $\gcd(13, 5)$ using Euclid's algorithm.

(b) Using your results from (a), what is 5^{-1} modulo 13?

(c) Verify part (b) using Fermat's Little Theorem.

Problem -3. Order of Group Elements

What is the order of 5 in Z_{13}^*?

Problem -4. Generators

Find a generator of Z_{11}^* - note that 11 is a safe prime, so you should be able to do this by hand!