

Homework 2, Due Wed July 16, 2014

1. (10 points) What is your name? Write it clearly. Staple your HW.
2. (10 points) Find two generators mod 13. Show your work.
3. (20 points) Write a table that gives, for every $x \in \{1, \dots, 16\}$, what $x^{-1} \pmod{17}$ is.
4. (10 points) Find ALL roots to $x^2 + 4x + 11 \equiv 0 \pmod{16}$.
5. (10 points) Find a quadratic equation that has at least 3 roots $\pmod{100}$.
6. (20 points) Alice and Bob are using the Vigenere Cipher. The key is YSP. Alice wants to send Bob the message
Mods are cool
What does Alice send?
7. (20 points) Alice and Bob are using the Matrix Cipher. The matrix is

$$\mathbf{A} = \begin{pmatrix} 5 & 7 \\ 3 & 2 \end{pmatrix}$$

Alice wants to send Bob the message (a book title)

Sarahs Approach to Codes

What does Alice send?

8. (0 points. If you know programming than do for fun.) Write a program that will, given a text and numbers m, s , produce the output of the Affine Cipher with Multiplier m and a shift of s . If the user inputs an m that is NOT rel prime to 26 then have the programs output
Your m was not rel prime to 26 you moron!
(or something similar).
Also write a program that decodes. Test them against each other.
9. (Extra Credit- not to help for a grade in this course, but will help for a letter of rec.) Find quadratic polynomials over mods that have LOTS of roots. Try to get as many roots as possible.

10. (For your own benefit) Look up on the web how to find the inverse of a matrix in the normal numbers. Ponder how that might change mod 26.