**Julia Sterling** **Homework 10** **Due 11-14-2014**

1. For this problem use the English letter frequencies from the website: `http://www.math.cornell.edu/~mec/2003-2004/cryptography/subs/frequencies.html`.

   You capture a ciphertext that you believe was enciphered with a monoalphabetic substitution and contains the word "lincoln". You check the frequency of each of the letters and make the following table:

| letter | frequency |
|---|---|
| a | 1143 |
| b | 298 |
| c | 111 |
| d | 239 |
| e | 15 |
| f | 197 |
| g | 7 |
| h | 1090 |
| i | 156 |
| j | 395 |
| k | 539 |
| l | 1583 |
| m | 331 |
| n | 220 |
| o | 572 |
| p | 896 |
| q | 24 |
| r | 52 |
| s | 498 |
| t | 263 |
| u | 1080 |
| v | 921 |
| w | 236 |
| x | 11 |
| y | 769 |
| z | 884 |
| total | 12530 |

   You do a $\chi^2$-test to see if the ciphertext characters "lbrwylr" correspond to "lincoln". What is the value of the $\chi^2$-statistic?

2. How many ways are there to form a committe of size 11 from a popluation of size 28?

3. Consider the plaintext: "Black holes are where God divided by zero".
   (a) Compute the index of coincidence for this plaintext.
   (b) If this was enciphered with a monoalphabetic substitution what would the index of coincedince be?
   (c) Encipher this with Vigenere with key word "be".

(d) What is the index of coincidence for this message.

(e) Compute the estimate of the length of the keyword for this ciphertext. Note with these few words it might not be that good of an estimate?

4. Find the following places on campus and take a picture of yourself in front of the office send it to me.

   (a) Career Services