John Slater **Homework 3** **Due 09-19-2014**

1. Find q, r with $0 \leq r < a$, so that $b = a \cdot q + r$ with:
   (a) $a = 615402, b = 923494$
   (b) $a = 587459, b = -3216885$.
   (c) $a = 183538, b = 108145$.
2. Compute the following:
   (a) 73637 % 9763
   (b) 361683205 % 709396
3. Without a calculator find the last digit of: $55 \cdot 38974 + 3326 \cdot 94622 + 2427 \cdot 31321$.
4. (a) Without a calculator determine the remainder of 307938212659 when it is divided by 9.
   (b) Is 307938212659 divisible by 9?
5. Encipher the message "tube" using an affine cipher with key $a = 15$ and $b = 20$.
6. (Wait until Wednesday to try this problem.) Find the inverse of 14 (mod 23) (that is, find c such that $14c \equiv 1 \pmod{23}$).

   Do one of the following two problems, you can do both for extra credit.
7. Prove that if $a \equiv b \pmod{m}$ and c is an integer then $a + c \equiv b + c \pmod{m}$. You will use both the definition of mod and divisablitly.
8. Prove that if $d|a$ and $d|b$ then $d|a + b$ and $d|a - b$.
9. Find the following places on campus and take a picture of yourself there and send it to me.
   (a) The Math Learning Center
   (b) The Logic Center
   (c) The Writing Center