Alessandra Cole **Homework 3** **Due 09-19-2014**

1. Find q, r with $0 \leq r < a$, so that $b = a \cdot q + r$ with:
   (a) $a = 237037, b = 1556676$
   (b) $a = 20174, b = -1860995$.
   (c) $a = 21228, b = 20288$.
2. Compute the following:
   (a) 21662 % 7665
   (b) 43080525 % 248039
3. Without a calculator find the last digit of: $7494 \cdot 13670 + 387 \cdot 20084 + 4280 \cdot 56129$.
4. (a) Without a calculator determine the remainder of 24833005125 when it is divided by 9.
   (b) Is 24833005125 divisible by 9?
5. Encipher the message "tube" using an affine cipher with key $a = 11$ and $b = 12$.
6. (Wait until Wednesday to try this problem.) Find the inverse of 12 (mod 31) (that is, find c such that $12c \equiv 1 \pmod{31}$).

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