

1. Find q, r with $0 \leq r < a$, so that $b = a \cdot q + r$ with:
 - (a) $a = 630605, b = 1854319$
 - (b) $a = 348639, b = -614331$.
 - (c) $a = 103549, b = 2003$.
 2. Compute the following:
 - (a) $90355 \% 232$
 - (b) $10245659 \% 47139$
 3. Without a calculator find the last digit of: $331 \cdot 6857 + 8634 \cdot 86001 + 7162 \cdot 82370$.
 4.
 - (a) Without a calculator determine the remainder of 307388113543 when it is divided by 9.
 - (b) Is 307388113543 divisible by 9?
 5. Encipher the message “tube” using an affine cipher with key $a = 5$ and $b = 17$.
 6. (Wait until Wednesday to try this problem.) Find the inverse of 7 (mod 31) (that is, find c such that $7c \equiv 1 \pmod{31}$).
- 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 divisibility.
 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