

1. Find  $q, r$  with  $0 \leq r < a$ , so that  $b = a \cdot q + r$  with:
    - (a)  $a = 673588, b = 2912002$
    - (b)  $a = 370527, b = -832655$ .
    - (c)  $a = 510489, b = 455759$ .
  2. Compute the following:
    - (a)  $68334 \% 1929$
    - (b)  $718217603 \% 504997$
  3. Without a calculator find the last digit of:  $6160 \cdot 47868 + 9105 \cdot 70338 + 1859 \cdot 99737$ .
  4.
    - (a) Without a calculator determine the remainder of 975899010721 when it is divided by 9.
    - (b) Is 975899010721 divisible by 9?
  5. Encipher the message "Broncos" using an affine cipher with key  $a = 11$  and  $b = 19$ .
  6. (Wait until Wednesday to try this problem.) Find the inverse of 5 (mod 19) (that is, find  $c$  such that  $5c \equiv 1 \pmod{19}$ ).
- 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