Section 4- Integers (114 points)

To receive credit, you must show your work on the worksheet.

1. (15 points) Express a in terms of b using the division algorithm:

   $a = bq + r$ ***(remainder must be positive)***

   To receive credit, you must show your work.

   a. (5 pts) a = 916, b = 7

   b. (5 pts) a = -201, b = 13

   c. (5 pts) a = 1335, b = 5

2. (20 points) Compute using modular arithmetic (positive remainders only)

   To receive credit, you must show your work.

   a. (6 pts) $203^5 \bmod 9$

   b. (6 pts) $(59^3 + 1301^3) \bmod 27$

   c. (8 pts) $(451 + 301 * (-70) - 2154) \bmod 43$

3. (19 points) What is the prime factorization of the following?
   To receive credit, you must show your work.

   a. (4 pts) 714

   b. (4 pts) 620

   c. (5 pts) 993 * 580

   d. (6 pts) $25^2 * 12^3$

4. (20 points) Find the following
   To receive credit, you must show your work.

   a. (5 pts) LCM(21, 612)

   b. (5 pts) LCM(1012, 150)

   c. (5 pts) GCD(190, 670)

d. (5 pts) GCD(1215, 7875)

5. (20) For the following pair of numbers, find the GCD and then use Euclid's algorithm to express the GCD as a linear combination of the two numbers.
To receive credit, you must show your work.

a. (20 pts) 190 and 100

6. (20 points) Convert the following numbers
To receive credit, you must show your work.

a. (6 pts) 219325_{10} to base 21

b. (6 pts) 112102_3 to base 10

c. (8 pts) $(1111011_2 + 1010000_2)$ to base 4