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

$916 = (130)7 + 6$

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

$-201 = (-16)13 + 7$

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

$1335 = (267)5 + 0$

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

To receive credit, you must show your work.

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

$= 2$

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

17

c. (8 pts) (451 + 301 * (−70) - 2154) mod 43

= 17

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

a. (4 pts) 714

= $2 \cdot 3 \cdot 7 \cdot 17$

b. (4 pts) 620

= $2^2 \cdot 5 \cdot 31$

c. (5 pts) 993 * 580

$2^2 \cdot 3 \cdot 5 \cdot 29 \cdot 331$

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

$= 5^4 \cdot 3^3 \cdot 2^6$

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

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

   $= 4284$

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

   75,900

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

   $= 10$

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

45

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

$10 = (2)100 + (-1)190$

so $x = -1, y = 2$

6. (20 points) Convert the following numbers *<bases above 16 continue the letter format of Hexadecimal>*
To receive credit, you must show your work.

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

$(12E71)_{21}$

b. (6 pts) 112102_3 to base 10

$= 389$

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

(3023)4