Name:

Section 5.1

1. For each integer below (i) trace the standard algorithm (Algorithm 5.1.8 page 226) to determine if it is prime and (ii) find its prime factorization.

(a) n = 966

(b) n = 127

2. For each pair of integers find (i) the greatest common divisor of the pair and (ii) the least common multiple of the pair.

(a) n = 30, m = 120

(b) n = 104, m = 363

(c) n = 72, m = 306

(d) $n = 2^2 \cdot 3 \cdot 5^4, m = 2^3 \cdot 5^3 \cdot 7$

3. For #2d, write n and m as products of the same set of prime factors.

- 4. Let $m = p_1^{a_1} p_2^{a_2} p_3^{a_3} \cdots p_n^{a_n}$ and $n = p_1^{b_1} p_2^{b_2} p_3^{b_3} \cdots p_n^{b_n}$ where $a_i, b_i \in \mathbb{Z}^{nonneg}$.
 - (a) Is $p_1^{a_1} p_2^{a_2} p_3^{a_3} \cdots p_n^{a_n}$ necessarily the prime factorization of m? Explain.

(b) Give formulas for the greatest common divisor and least common multiple of m and n.

5. Write a formal, direct proof of the following:

Let n, c, and d be integers. If $dc \mid nc$, then $d \mid n$.

Section 5.2

- 1. When a number is represented in
 - *decimal* form, digits are selected from the set { } and each position represents a power of _____

So the expansion of the symbols: 8032 is _____

• *binary* form, digits are selected from the set {_____}} and each position represents a power of ______

So the expansion of the symbols: 1101 is _____

• *hexadecimal* form, digits are selected from the set { } and each position represents a power of _____

So the expansion of the symbols: 20AF is ______

2. Express the binary number 1101010 in decimal.

3. Express the decimal number 357 in binary.

4. Express the hexadecimal number A105 in decimal.

5. Express the decimal number 10400 in hexadecimal.

6. Assume you are given a decimal integer n, how many bits (digits) would you need to represent n in binary? (If you don't immediately know the answer, return to #3 and think about how you calculated it.)

7. Without actually finding the binary representation, determine the number of bits needed to represent the decimal number 2, 500, 230.