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 $\# 2 d$, 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 $a_{i}, b_{i} \in \mathbb{Z}^{\text {nonneg }}$.
(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 $d c \mid n c$, 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 $\qquad$

So the expansion of the symbols: 8032 is $\qquad$

- binary form, digits are selected from the set \{ \} and each position represents a power of $\qquad$

So the expansion of the symbols: 1101 is $\qquad$

- hexadecimal form, digits are selected from the set \{ \} and each position represents a power of $\qquad$

So the expansion of the symbols: $20 A F$ is $\qquad$
2. Express the binary number 1101010 in decimal.
3. Express the decimal number 357 in binary.
4. Express the hexadecimal number $A 105$ 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 $2,500,230$.

