Name:

CSE 1400 Applied Discrete Mathematics

Fall 2012 Quiz Four

Score

1. (30 pts) Let a and b be integers and let n be a positive integer. Consider the relation "a is congruent to b mod n", written $a \equiv b \pmod{n}$, and meaning $(\exists c \in \mathbb{Z})(a - b = nc)$.

   (a) Is "congruence mod n" reflexive? Explain your answer.
   Answer: Yes, congruence mod n is reflexive: $a - a = 0$ is a multiple of n.

   (b) Is "congruence mod n" symmetric? Explain your answer.
   Answer: Yes, congruence mod n is symmetric: If $a - b$ is a multiple of n, then $b - a$ is a multiple of n.

   (c) Is "congruence mod n" antisymmetric? Explain your answer.
   Answer: No, congruence mod n is not antisymmetric: If $a - b$ is a multiple of n and $b - a$ is a multiple of n, it does not follow that $a = b$.

   (d) Is "congruence mod n" transitive? Explain your answer.
   Answer: Yes, congruence mod n is transitive: If $a - b$ is a multiple of n and $b - c$ is a multiple of n, then $a - c = (a - b) + (b - a)$ is a multiple of n.

   (e) Is "congruence mod n" an equivalence relation? Explain your answer.
   Answer: Yes, congruence mod n is reflexive, symmetric, and transitive.

   (f) Is "congruence mod n" an partial order? Explain your answer.
   Answer: No, congruence mod n is not antisymmetric.

Score

2. (10 pts) How many relations can be defined on a set with cardinality m?

   Answer: There are 2^{m^2} relations.

Total Points: 40