CISC-102 WINTER 2019

HOMEWORK 7

Assignments will **not** be collected for grading.

Readings

Read sections 11.8, 5.1, 5.2, 5.3, 5.4, 5.5, and 5.6 of *Schaum's Outline of Discrete Mathematics*.

Read section 6.7, 3.1 and 3.2 of *Discrete Mathematics Elementary and Beyond*.

Problems

(1) Find all Natural numbers between 1 and 50 that are congruent to 4 (mod 11).
(2) Find two Natural numbers a and b such that $2a \equiv 2b(\mod 6)$, but $a \not\equiv b(\mod 6)$.
(3) Prove that if $a \equiv b(\mod m)$ and $c \equiv d(\mod m)$ then $a - c \equiv b - d(\mod m)$.
(4) Write out each of the 5 residue classes (mod 5) for integers in the range -10 to 10.
(5) Let S be a finite subset of the positive integers. What is the smallest value for $|S|$ that guarantees that at least two elements $x, y \in S$ have the same remainder when divided by 100. HINT: Use the pigeon hole principle.
(6) Prove that any set of 5 natural numbers will always have two numbers n_1 and n_2 such that $4|(n_1 - n_2)$. Hint: Use the Pigeon Hole Principle.
(7) New parents wish to give their new baby one, two, or three different names. They have a book containing 500 names that they will choose from. How many different ways can this baby be named?
(8) You have chosen a password that consists of 4 upper case letters from a 26 letter alphabet. How many passwords does a hacker have to try to be sure that they can break in? What if you may use both upper and lower case for your four symbol password? (Note: You may use upper and lower case letters, but that does not preclude the possibility that all of the letters are upper case or lower case.) Finally consider a password 7 symbols long and you may use both upper and lower case letters, and at least one digit $(0 \ldots 9)$.
(9) How many different strings can you make using the letters TIMBITS?