Homework Assignment no. 2
Date: Due week of Oct 25 (Oct 25 for lecture B and Oct 28 for lecture C)

Your assignment should include complete sentences and explanations and not just a few equations, tables or numbers. A solution will not receive full credit unless you explain what your answer represents and where it came from. You may discuss the homework with other students in the class, but please write your own solutions. The following problems are adapted from "What is the Name of this Book : The riddle of Dracula and other logical puzzles."

(1) A bank was robbed and Inspector Craig and Sergeant McPherson were on the case trying to establish the guilt or innocence of three suspects Alice, Bob and Carol. The nefarious characters are the only people who could be involved in these bank robberies and at least one of them is guilty. In each case the Inspector and Sergeant establish certain facts.

   Write an argument in words to establish the guilt or innocence of Alice, Bob and Carol. Note that the clues provided may not be sufficient to determine the guilt and innocence of all of the suspects, but should be sufficient to establish the guilt of at least one person.

   Say that we establish that:
   (A) If Alice was guilty, then she had an accomplice.
   (B) If Bob is innocent, then so is Carol.
   (C) If exactly two are guilty then Alice is one of them.
   (D) If Carol is innocent, then so is Bob.

   Translate each of the clues to a truth valued sentence using the connectives *and*, *or*, *not* and *if ... then* and the propositions: A representing the statement "Alice is guilty," B representing the statement "Bob is guilty" and C representing "Carol is guilty." Create a truth table establishing the truth values of the clues in terms of the truth values of A, B and C.

(2) Suppose that there are two neighboring islands each inclusively inhabited by knights and knaves (knights always tell the truth and knaves always lie). You are told that on one of the two islands there is an even number of knights and on the other one there is an odd number of knights. You are also told that there is gold on the island containing an even number of knights, but there is no gold on the other. You pick one of the two islands at random and visit it. All the inhabitants know how many knights and how many knaves live on the island. You are interviewing three inhabitants, A, B and C and they make the following statements:
   (A) There are an even number of knaves on this island.
   (B) Right now, there are an odd number of people on the island.
   (C) I am a knight if and only if A and B are of the same type.
   Assume that you are neither a knight or a knave and that at the moment you are the only visitor on the island.

   (a) Assume that A is a knight. Which of the 4 ways of labeling B and C as knights and knaves makes A's statement true? Assume that A is a knave. Which of the 4 ways of labeling B and C as knights and knaves makes A's statement false?
   (b) Assume that C is a knight. Which of the 4 ways of labeling A and B as knights and knaves makes C's statement true? Assume that C is a knave. Which of the 4 ways of labeling A and B as knights and knaves makes C's statement false?
   (c) Is there gold on the island or not? Which of A, B and C are knights and knaves? Why?