**CS 121 Homework Assignment One**

**For each problem below write a sequence of steps that will lead to a solution. You may print out the homework and turn it in as hard copy or you may upload the Word file (or other word processor) to the drop box on Angel. No handwritten submissions.**

1. A farmer needs to transport a fox, goose and a basket of corn across a river. He has a boat that can only carry him and one of the three items at a time. He cannot leave the goose with the corn since the goose would eat the corn. Similarly he cannot leave the goose with the fox since the fox would eat the goose. Show the sequential order of steps that will get the fox, corn and goose across the river successfully.
2. Suppose that you need to replace carpet in two rooms of a house. You have contracted a carpet company to install the carpet, but to save money you have decided to clear the rooms of all furniture yourself. Each room has 6 pieces of furniture with one piece (in each room) requiring two people to move. You have one person to help you. Show the sequential order of steps for emptying both rooms of furniture. Show steps that can be performed simultaneously by each person.
3. A traffic signal has just been installed at an intersection of two streets. One street (Main) has a traffic volume of **four times** that of the crossing street (Oak). Develop an operating sequence (set of steps) for the traffic light. You can assume that you have the following operations for the light. (N is the number of seconds that a light stays on.)
   1. Red\_On(N)
   2. Yellow\_On(N)
   3. Green\_On(N)
   4. Red\_Off
   5. Yellow\_Off
   6. Green\_Off

All lights are off when you begin. Show the steps for the lights facing drivers on both roads. Assume a simple three light signal. (no turn arrows etc.)

Light Status for drivers on Main Light Status for Oak

1. Assume that you have a robotic arm that can move square blocks from an input chute to a series of 10 pigeonhole like slots. The robot can perform the following operations:
   1. Get Block – Removes and holds one block from the chute
   2. Put Block – Inserts the block currently held by the robot into an **empty** slot.
   3. Switch Blocks – Removes a block currently in a slot and replaces it with the block being held by the robot. When finished the robot is holding the block it just removed from the slot.
   4. Compare Blocks – Compares the value of the block (letter) being held by the robot to that of a block in a slot. (The result is either less than or greater than. E.g. A > B is False)
   5. Shift Left – Shift the robotic arm one slot to the left. (Cannot go to the left of slot 1)
   6. Shift Right – Shift the robotic arm one slot to the right. (Cannot go to the right of slot 10)
   7. Test Empty – Determines if a slot is empty. (True if empty, False if occupied by a block.)

Suppose that ten blocks containing alphabetic letters are placed into the chute one at a time. Show a sequence of operations that will result in the blocks being placed into the 10 slots in **alphabetic** order. You may pick the initial location for the robot. For example the robot may be in front of slot 3 at the beginning.