Problem 1:
Let p, q and r be the propositions given below:
   p: The birdwatchers are in the woods.
   q: A blue heron was seen at the lake.
   r: Migration starts soon.
Part A:
Put the sentences below into symbolic logic notation.
   a) No blue heron was seen at the lake, but the birdwatchers are in the woods.
   b) It is not true that migration will not start soon.
   c) Migration starts soon or a blue heron is seen at the lake.
   d) Either the birdwatchers are in the woods or migration has not started soon.
Part B:
Put the symbolic logic notation into English sentences.
      a) (p \land q) \lor p \quad \text{(use Absorption Law)}
      b) \neg (p \lor r) \land q \quad \text{(use DeMorgan's Law)}
      c) \neg p \lor (r \land \neg q)
      d) (p \lor \neg q) \land \neg q \quad \text{(use Absorption Law)}

Problem 2: For each of the sentences below, determine whether an ‘exclusive or’ or an
‘inclusive or’ is intended.
1) To go the game cheerleaders can go either by bus with the band or by air with the team.
2) The next question is true or false.
3) You can help clean the kitchen or the bathroom.
4) You may either go to the retirement party or the play which are each at 8pm tonight.

Problem 3:
Construct a truth table to verify the following equivalence relation:
   \neg (p \land \neg q) \land q \equiv q

Problem 4: Prove the following using set algebra.
Theorem 1: [(\neg p \lor q) \land \neg p] \lor (\neg p \lor q) = \neg (p \land \neg q)
Problem 5:

Logic Puzzle:
Solve the following puzzle and then write up a paragraph explaining your reasoning. Use your own judgment on how to write this up. It needs to be clear to anyone who tries to follow your write up. Do not use tables or charts in your presentation.

The Spelling contest:
There were five finalist at the Blacksburg Middle School Spelling Bee. They competed till four of the five had misspelled a word and the last student was declared the winner. Given the following statements below (one of which is false), find the first and last name of each of the finalist where surnames are given to be Snider, Johnson, Owens, Keener, or Murphy. Determine who missed which word and what was the order in which they finished the competition.

STATEMENTS:
1) Owens, who was not the one who misspelled “pneumonia” had not participated in a Spelling Bee before He said he had not expected to do well.
2) “Vicissitude” was misspelled immediately after “bivouac” and immediately before “isthmus”.
3) Eleanor was happy that her good friend Snider was one of the two finalist in the contest.
4) Before Eric misspelled his word there were only two contestants left. He and Keener had studied together to prepare for the Spelling Bee.
5) Max, who lasted longer in the competition than Snider was not the winner.
6) Johnson, who is not Anna, was the first to misspell a word.
7) Anna, Snider, and Keener were neighbors.
8) Snider told Louise that she could not sleep the night before the contest.