Problem 1

6.1 How many solutions are there for the map-coloring problem in Figure 6.1? How many solutions if four colors are allowed? Two colors?

Problem 2

6.2 Consider the problem of placing k knights on an $n \times n$ chessboard such that no two knights are attacking each other, where k is given an $k \leq n^2$.

a. Choose a CSP formulation. In your formulation, what are the variables?

b. What are the possible values of each variable?

c. What sets of variables are constrained, and how?

d. Now consider the problem of putting *as many knights as possible* on the board without any attacks. Explain how to solve this with local search by defining appropriate `ACTIONS` and `RESULT` functions and a sensible objective function.

Problem 3

6.11 Use the AC-3 algorithm to show that arc consistency can detect the inconsistency of the partial assignment $\{WA = green, V = red\}$ for the problem shows in Figure 6.1.

Problem 4

7.6 Prove, or find a counterexample to, each of the following assertions:

a. If $\alpha \models \gamma$ or $\beta \models \gamma$ (or both) then $(\alpha \wedge \beta) \models \gamma$

b. If $\alpha \models (\beta \wedge \gamma)$ then $\alpha \models \beta$ and $\alpha \models \gamma$

c. If $\alpha \models (\beta \vee \gamma)$ then $\alpha \models \beta$ or $\alpha \models \gamma$ (or both)

Problem 5

7.18 Consider the following sentence:
$[(Food \Rightarrow Party) \vee (Drinks \Rightarrow Party)] \Rightarrow [(Food \wedge Drinks) \Rightarrow Party]$

a. Determine, using enumeration, whether this sentence is valid, satisfiable (but not valid), or unsatisfiable

b. Convert the left-hand and right-hand sides of the main implication into CNF, showing each step, and explaining how the results confirm your answer to (a)

c. Prove your answer to (a) using resolution.