**Problem 1**

1.

a) In this problem, one must move three items from one location, or categorization, to another while keeping the items, each of which is volatile to one of the other two, from harming another.

b) This problem has been around for quite some time. It was created to encourage critical thinking and problem-solving skills. There is really only one way to begin that meets all of the requirements.

c) The overall goal is to arrive on the other side of the river with all three items, without putting any of them at risk.

2.

a) The constraints of this problem are that we can’t have the cat and parrot, or the parrot and seeds, together in the same location (or category) unattended.

b) The sub-goals would be to get each of the items over to the other side individually, adhering to the constraints. In other words, moving the cat to the other side, moving the parrot to the other side, and moving the bag of seed to the other side.

3.

a) At first glance, there are nine different possible solutions to this problem; however, not all of these solutions are guaranteed to meet the constraints. If we set variable names for each item (i.e. cat=c, parrot=p, and seed=s), and we write the solution as the order of the variables that we bring over, then the potential solutions would appear to be: cps, csp, pcs, psc, scp, and spc. However, it quickly becomes clear that, in order to meet the constraints, an item will have to be brought back. This adds a great deal to the number of possible solutions.

4.

a) None of the solutions specifically mentioned in #3 meets all of the goals; however, the idea of bringing an item back to it’s original location is mentioned, and if done correctly, it will work as a full solution.

b) No solution will work for all cases.

5.

a) There are two solutions that would meet all goals. Both solutions follow the same principle, and either is just as effective and efficient. The first solution is as follows:

Take p over to the destination first. Go back to the original location and take c. When putting c at the destination, take p. Bring p back to the original location. Leave p and take s. Bring s to the destination. Return to the original location and take p. Bring p to the destination, ending with all three at the destination and unharmed.

The other solution is in the same order, but instead of taking c second, take s.

Both solutions can be thought of as one in the same, as they are along the same train of thought.

b) As I had already known the solution to this problem, I didn’t have any test cases; however, it is obvious that if one would have started with any other item, or had failed to bring back the parrot after dropping either of the other two objects at the destination, one of the constraints would have been broken.