PROBLEMS:

For each of the problems be sure to identify each of the steps discussed in the problem solving lesson.

1. Define the problem.
   1. Do this in your own words.
   2. What insight can you offer in to the problem that is not immediately visible from the word problem alone?
   3. What is the overall goal?
2. Break the problem apart.
   1. What are the constraints?
   2. What are the sub goals?
3. Identify potential solutions.
   1. For each of the sub problems you’ve discussed in #2, what is a possible solution?
4. Evaluate each potential solution.
   1. Does each solution meet the goals?
   2. Will each solution work for ALL cases?
5. Choose a solution and develop a plan to implement it.
   1. Explain the solution in full.
   2. Describe some test cases you tried out to make sure it works. (You can include drawings, and diagrams as part of your explanation as long as they are clearly communicating the solution.

Problem #1:

A Cat, a Parrot, and a Bag of Seed:

A man finds himself on a riverbank with a cat, a parrot and a bag of seed. He needs to transport all three to the other side of the river in his boat. However, the boat has room for only the man himself and one other item (either the cat, the parrot or seed). In his absence, the cat could eat the parrot, and the parrot would eat the bag of seed. Show how he can get all the passengers to the other side, without leaving the wrong ones alone together.

1.

1. The problem is the man needs to figure out the best way to get everyone safely across the river without risking the animals eating each other or the food and he can only take one item at a time.
2. I am not sure there is much insight into the problem; to me it’s pretty straightforward.
3. The overall goal is to get everyone safely across without them eating each other.

2.

A. The constraints are that he cannot leave the parrot alone with the cat because the cat might eat the parrot. He also cannot leave the parrot alone with the seed as the parrot might eat all the birdseed. The last constraint is he can only take one item at a time across the river in his boat.

B. The sub goals are to get one item across successfully without any repercussions, such as the cat eating the bird, or the bird eating the seed.

3.

A. One possible solution would be to put the bird in a cage; this will prevent the bird from eating the seed, or the cat from eating the bird. The other solution might be to put the cat in a cage, and then the cat couldn’t eat the bird and could be left alone with the seed.

4.

A. I feel that each solution would successfully meet the goals.

B. The only issue with my solutions is the question of if the man owns a cage, if not, how is he transporting the parrot in the first place? Is he carrying the parrot on his shoulder? If so, then he could have the parrot on his shoulder, and the birdseed in the boat, and come back for the cat separate right?

5.

A. My solution would be to put the parrot in a cage. This way the man could transport the parrot on it’s own, leave it, come back and grab the seed and leave it with the parrot. The parrot being in the cage wouldn’t be able to get to the seed, and the man would be able to head back safely grabbing the cat for transport.

B. I am not sure a drawing is necessary for this problem.

Socks in the dark:

There are 20 socks in a drawer: 5 pairs of black socks, 3 pairs of brown and 2 pairs of white. You select the socks in the dark and can check them only after a selection has been made. What is the smallest number of socks you need to select to guarantee the following:

1. At least one matching pair.
2. At least one matching pair of each color.

1.

A. The problem in my own words is that you have 20 socks in a drawer, and you need to pick out a matching pair in the dark. What would be the smallest number of socks you would pull out to have the greatest chance of picking a matching pair?

B. The best insight would be that at least the socks aren’t left or right footed only socks, and with 10 black socks, you would have the best chance of picking a pair of those than the others.

C. The overall goal is to pick a matching pair of socks.

2.

A. The constraints are the darkness, and the amounts of socks vary per color. Black socks are more prevalent than the others.

B. To select a matching pair quickly, and then to select a matching pair of each color quickly.

3.

A. One possible solution is to pick 2 socks, then mark what they are down, if they don’t match, pick another 2 socks. I would do this until I reached 10 socks, at this point I should have possibly matched at least a pair of black socks. They are the most prevalent with 10 total out of 20 socks. You could do this by setting up the experiment on your own.

4.

A. This solution would meet the goal of answer of how many sock would be needed to make at least one matching pair. This solution would also answer the second question of how many

B. This solution would work because you would be testing your theory out as in the question to find the results.

5.

Predicting Fingers: A little girl counts using the fingers of her left hand as she follows: She starts by calling her thumb 1, the first finger 2, middle finger 3, ring finger 4, and a little finger 5. Then she reverses direction, calling the ring finger 6, middle finger 7, first finger 8 and thumb 9, after which she calls her first finger 10 and so on. If she continues to count in this manner, on which finger will she stop?

1. What if the girl counts from 1 to 10?
2. What if the girl counts from 1 to 100?
3. What if the girl counts from 1 to 1000?