**Problem Solving**

Web Programming Fundamentals

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

1. **Define the problem.**

A man needs has three items with him, and he needs to go to the other side of the river with these three items. These items are a cat, a parrot and a bag of seeds. One problem is that he has a small boat where there’s only space for the man and one item. Second problem is that if he takes the wrong item, it could be the end of a second item, and end up with only two of the three items on the other side of the river. If he takes the bag of seeds with him on the boat, and leaves the cat with the parrot, the cat would eat the parrot; and is he takes the cat and leaves the parrot alone with the bag of seeds, than the parrot would eat the seeds.

He needs to take all three things to the other side.

1. **Break the problem apart.**

The main problem the man has is to cross all three items to the other side of the river.

The constraints are he can’t leave the cat and the parrot alone, or the bag of seeds with the parrot without his supervision.

The sub-goals are to save the parrot and to keep the bag of seed untouched.

1. **Identify potential solutions.**

The man could put the cat and the bag of seeds in the boat or any combination of two of the three items, but who is going to row the boat to the other side?

He could leave the cat and the parrot, and take the bag of seeds with him to the other side.

He could take the cat, and leave the parrot and the bag of seeds.

He could go alone on the boat and leave all three items unsupervised.

1. **Evaluate each potential solution.**

If the man leaves the cat and the parrot on the side of the river, without his supervision, the cat would eat the parrot. Not a solution.

If the man leaves the parrot and the bag of seeds and takes the cat, the parrot would eat all the seeds. Not a solution.

If he take the parrot with him, and leaves the cat with the bag of seeds, then everything would be fine.

1. **Choose a solution and develop a plan to implement it.**

The solution is: The man needs to cross the river with the parrot first, leaving the cat and the bag of seeds behind. He leaves the parrot on the other side and goes back to get the cat. He takes the cat to the other side, and gets the parrot and takes it with him where he left the bag of seeds. He leaves the parrot on that side and takes the bag of seeds with him to the other side, where the cat is. Then he returns to pick up the parrot, leaving the cat and the bag of seeds on that side. He goes alone to pick up the parrot, he gets the parrot, and man and parrot get to the other side to join the cat and the bag of seeds. And everyone is just fine.

**Socks in the Dark**

**1. Define the Problem**

This is a problem about probabilities and expected outcomes.

I am trying to solve a problem with multiple variables (each color of sock is one different variable, so there are three variable to consider).

The different quantities of each color make this more challenging because the higher counts of one color will affect the odds (it’s no longer a purely random event as it would be if there were an equal number of each color).

If the socks were already folded into pairs, the first part of the problem would not exist, as you would always be guaranteed to pull out a matching pair; however, if you wanted to be guaranteed to pull out one of each color, you would still need to pull out more than just 3 pairs.

Overall goal is to figure out how many socks I have to pull out of the drawer so that when I look at them, I can be sure to have a pair that match, and after that, be guaranteed that I have 3 pairs of different colors to choose from.

Figure out why I’m too lazy to just turn on the light so that I only have to pick two socks, or at least fold them before putting them away so that I have to pull out fewer socks.

**2. Break the problem apart**

What are the constraints?

Not only do I need to pull out a pair of socks that match each other, but also I need to pull out one of each pair.

What are the sub-‐goals?

There is a difference between getting just any pair of socks to match and getting the color that I will want so that it matches my outfit.

**3. Identify potential solutions**

Pull out all of the socks each time and then match them up.

Fold the socks before putting them away.

Keep them in different drawers by color.

Figure out just how many to pull out to get a matching pair of any color, and a matching pair of each color.

**4. Evaluate each potential solution**

Given the constraints, the only possible solution is the one that gives me the guarantee to pull out one matching pair of any color, and one matching pair of each color.

Will each solution work for all cases?

No. The solution to get only one matching pair of any color is not guaranteed to work when I want one matching pair of each color.

**5. Choose a solution and develop a plan to implement it.**

By thinking this through logically, I concluded that to get one matching pair of any color, I have to pull out only four socks. That’s because even if I pull out one of each color on the first three tries, the fourth try is guaranteed to deliver a sock that will match one of the colors that I already have, since there are only 3 colors of socks in the drawer. I could possibly end up with a matching pair after pulling only two socks, but there is no guarantee of that, while pulling out four socks gives me a 100% chance of having a matching pair of any color.

I used the same logic to conclude that to get one matching pair of each color, I have to pull out 18 socks. That’s because there are 10 black socks, 6 brown socks, and 4 white socks. In the worst-case scenario, if I pull out 16 socks, I could end up with 5 pairs of black socks and 3 pairs of brown socks, but no white ones. So I would have to pull out 2 more socks, which would be white ones because logically, those would be the only ones left. I could possibly get 3 different pairs while pulling out a smaller number of socks, but that would not be a guaranteed outcome.

I wrote out different scenarios, assuming a different color pulled each ones. In all cases, I could not disprove my answers.