A Cat, a Parrot and a Bag of Seed

There is a man on a riverbank with a cat, a parrot and a bag of seed. The man wants to transport each item over to the bank a crossed the river. The man needs to bring each item over one at a time, seeing his boat can only hold one item at a time. The problem he is facing is he cannot leave certain items paired together. (E.g. the cat eats the parrot, the parrot eats the seed) We need to see how the man can attempt to do this while not leaving faulty pairings together. If we look at the question a little harder, it does not state that the man cannot bring an item back to the original bank. This will be useful in finding a solution.

The goals the man wants to achieve are, getting every item over to the opposite bank and to not leave a pairing that can be bad together. Possible solutions for this is to bring one item over to the bank, came back and retrieve a second item. Then he would transport that item over to the bank with the first item. That would leave the man with one item left to transport, but he risks the case of leaving a bad pairing. In order to avoid this he could bring the original item back to the original bank, and them transport the third item over to the other bank. The man would then be left to go and retrieve the original item and finally bring it to the opposite bank.

There is only one choice the man could make on picking his first item, and that would be the parrot. By doing this, the parrot is safe from the cat and the bag of seed is safe from the parrot. The second item he transports could be either the cat or the bag of seed. Now that he has the parrot and the seed of cat on the opposite bank he faces his first problem. Either of these pairings comes with consequences. So in order to avoid leaving the bad pairing he would have to take the parrot back with him to the original bank. He then could bring either the bag of seed or cat, depending on what he chose as a second item over to the opposite bank. This would prevent any consequences. So that would leave the man to go retrieve the parrot and finally bring him to the opposite bank to finish his overall goal of having all 3 items on the opposite bank.

In order to test this theory, I had to draw out the situation at hand. This would include the faulty pairings and the fact he could only bring one item with him at a time. When not bringing an item back with him the second trip, no matter what two items he brought over there would be a consequence leaving them alone. The solution only works if the parrot is brought over first, if not the parrot would be left with the bag of seed or the cat.

Socks in the Dark

In a drawer there are 20 socks: 5 pairs of black socks, 3 pairs of brown socks and 2 pairs of white socks. In the dark you are asked to select the socks, but can now see what color they are until you have actually selected them. We need to be able to achieve two goals: guarantee at least one matching pair and at least one matching pair of each color. The stipulations behind these goals are that we have to do these tasks in the smallest amount of socks pulled. The overall goal is to always pull the least amount of socks possible to guarantee our results.

We can tell that there are 10 black, 6 brown and 4 white socks just by knowing there are two socks to a pair. This gives us a 50% chance for black, a 30% chance for brown and a 20% chance for white. The problem with trying to select a matching pair is that we cannot see what we are choosing because we are in the dark. So when we look at the first goal a solution would to be keep pulling different amount of socks till we end up with a matching pair. This could also be the case for trying to get a matching pair of each color.

For finding a single pair of socks we would only need to draw a max of four socks to guarantee this result. By pulling four socks we are certain to get at least one matching pair based on the percentages of colors. When we look to guarantee a matching pair of each color things become more complicated. The are many instances where we could get matching pairs at a lower number of pulls but this does not give a guarantee but instead just a possibility. In order to get matching colors of each pair we would have to pull 18 socks. No matter how we pull them this is the only guarantee.

To test the solution for getting one matching pair I added 3 pairs of different color socks to my dresser draw and drew random number of times. At the fourth pull every time I was able to have at least one matching pair. In order to test the solution for our other goal of getting matching pairs of each color I thought about the percentages that each color has. With black having a 50% chance of being pulled, there are to many outcomes that could lead to the other colors being picked. If we choose 18 socks, we are only left with two socks. This would make every color pulled and give us a matching pair.