A Cat, a Parrot and a Bag of Seed

1. The problem in this little story is that a man needs to figure out how to safely take his remaining three items across the river. He needs to do this in a way so that they don’t eat each other. Does he have a cage for the parrot; does the cat have a carrier or a leash? Does he have an inflatable raft or something that he can tie to his boat to fit all his “passengers”, are there people nearby that could help watch to make sure his cat didn’t eat the bird or the bird ate the seed? It never says how long the trip across the river is, it could be short or it could be long. The overall goal is to get to the other side of the riverbank safely and with his animals and seed intact.
2. If he takes the seed first then the bird may be eaten by the cat, if he takes the cat first then the bird may eat the seed. If he takes the bird first he will be fine on the original side but he will still have to make the same decision on the second run as to which to take. His goals are to get the bird across in one piece and alive, get the bag of seed across intact.
3. If he takes the seed first then the cat may eat the bird, if there were other people around then he could ask them to keep an eye on the cat while he made his first trip. He could also use a rope to tie the cat to a tree so that the cat would not eat the bird in his absence. If he decided to take the cat first then he could always leave a little bit of seed on the ground for the bird to eat so that the bird wouldn’t get into the bag. He could also take the bird with him every time, why couldn’t the bird sit on his shoulder while he is in the boat? Then he could ferry the cat and the seed to the other side without having to worry about one eating the other.
4. The solution to have other people around to watch the cat would work if there were other people around but if there weren’t you would still be in the same position and who knows if you could trust that random stranger you just met. If by some odd chance that a person with a boat did not have a rope then tying the cat would not work well. So those solutions to that problem put him right back to his original issue. If he took the cat first then leaving seed would be good unless the river was a mile across then he would probably lose more seed than he left on the ground. Plus it doesn’t really define how big of a bag of seed it was so maybe he only has enough for a few feedings. So this probably wouldn’t work in every scenario he may have had to face. Now if he decided to take the bird with him every time (I know it said he could only take one item on the boat at a time, but technically the bird would not be on the boat) on his shoulders then he could take the trips without the fear of losing anything. People walk around with their pet parrots on their shoulders all the time and that doesn’t take up any room in the boat. So I think that solution would be the best in any situation that could possibly come up.
5. The solution here is that the man with the boat, cat, parrot and seed is only going to make two trips. He will do this by placing the bird on his shoulder and taking the cat with him on the first trip across the river. He will then return to the bank and pick up the seed and ferry that across to the other side all the while the bird will be perched on his shoulder. If he has a boat with a cabin then the bird will still fit because the man has to have head room in order to be able to navigate the river so that would give the bird plenty of room on his shoulder. If he has an open type drift boat then it would be even easier for the man to place the bird on top of his shoulder and ferry across the cat and then the seed. I think this is the best solution especially not knowing all the variables of how long of a trip it is across the river, if he has ropes, how big of a bag of seed is it and whether or not he can afford to lose any seed (it sounds like he can’t afford to lose any).

Socks in the Dark

1. The problem here is that someone doesn’t like to fold their socks together, which makes pulling a matching pair out in the dark a daunting task. We have a drawer full of 20 socks of three different colors and we want to find out how many pulls it will take to pull a matching pair. The overall goal is to pull a matching pair of socks.
2. Here we see a problem with the amount of different colors of socks in the drawer. It is dark at the time of the sock pull so there is no visual on the color you are choosing. It will be hard to get a specific color if you care which color you want for the day.
3. To solve the issue of the amount of socks in his drawer it would be a good idea to organize his choices into sections of his drawer so that he will always choose the right color of sock with just one pull. Having no visual this person would also need to combine like colors of socks to avoid having that chance of picking a non matching pair of socks. However in order to solve the equation as it sits we would need to take the probability of pulling a matching pair of socks in the shortest amount of pulls. This would require us to use the black socks since there are more of them you have a better chance of choosing a pair of them. In order to get a matching pair of each color sock you are looking at an almost improbable ratio but you would have to find out the ratio of pulling a matching pair of each sock and then multiply those together to get the probability of grabbing one pair of each color.
4. Well the solution to placing the socks in ordered pairs in the drawer would solve the problem and would give him his desired outcome every time, but that is not the answer to the questions in the problem. For getting a pair of matching socks quickest you would have to use the black socks since there is a higher number of them so this would answer the first question. For one matching pair for each sock color the formula would work but the results would be hard to come by. Each solution would meet the goal of the question to find out how many socks you need to select in order to be guaranteed a matching pair. This would not necessarily work in every case as this is just probability unless the person decided to organize their drawer in colors and pairs.
5. For part A we would choose the black socks as the best chance for pulling out a pair. Since you have 10 black socks you have a probability of ½ pulling that color first and probability of 9/19 of pulling one the second time. There are 20 socks in total and 10 black socks total, this gives you your first ratio of 1/2, since you already selected one black sock that leaves you with 9 out of a possible 19 socks since one is missing because you took it. So if we take those two values and multiply them you would have a 9/38 chance of pulling a pair of black socks. So if you randomly pulled a pair of socks 38 times, 9 times you would end up with a pair of black socks. If you do the same math for the other colors of socks you will find a less likely ratio of pulling the same pair. For the brown socks you would have a 6/20 chance of pulling a brown sock on the first pull and a 5/19 chance the next pull leaving you with a total ratio of 3/38 which means that out of 38 pulls 3 would be a matching pair of brown socks. If you take the white socks and do the same ratio values you would get a far worse probability of 3/95. I get this number by the same process, you would take the first pull ratio of 4/20 and then the second pull ratio of 3/19 and then multiply those together and that would give you the result of 3 matching pairs for every 95 pairs pulled. So for A to be guaranteed a matching pair you would need to pull 5 times according to my calculations, so that would mean you need to pull at least 10 socks in order to be guaranteed a matching pair. If you wanted a matching pair of each color sock for B then you would have to pull more socks than you would for just one matching pair. I took the probability of pulling a pair of each sock and multiplied them together like this 9/38 \* 3/38 \* 3/95= 81/7,220 which means you would have to pull 7,220 pairs in order to get a matching set of each color 81 times. This would calculate out to being guaranteed (as far as probability goes) a pair of each color of sock after pulling 90 pairs or 180 socks.

Predicting Fingers

1. The problem is that the little girl is counting to ten on one hand and is probably confusing herself in the process. We are needing to find out where she will land if she continues to count this way on her left hand, the problem itself is unclear because I would think by reading it that if she counts this way every time then she would always end up on her first finger, but if she continues to count after reaching 10 on her first finger and moving to the middle finger for 11 then we have an issue, so that is what I will solve for. Our overall goal is to come up with an equation that will predict where the little girl will end up on 10, 100 and 1000.
2. Our first constraint would be that she is counting in an odd manner so we need to find an equation to adjust for that. Figure out what the pattern would be to predict where she would end up at any multiple of 10.