**Problem 1:**

A dude finds that he needs to cross a river with his cat, his parrot, and a bag of seed. Unfortunately the boat is only big enough for him and one other thing. There are some issues though, if he leaves the cat alone with the bird, the cat will eat the bird. If he leaves the bird alone with the seed, the bird will eat the seed.

Initially the problem seems easy, but it is deceiving. The guy cannot just take one item over at a time. It has to be done very specifically other wise he will lose one of the items.

The goal is to get everything across the river without loosing something.

The constraints are the limited space in the boat, the cat wanting to eat the bird, and the bird wanting to eat the seed.

Sub goals:

Prevent the bird from being eaten.

Prevent the seed from being eaten.

**Potential solutions:**

One solution for keeping the bird alive would be move it across first. Then move the cat and bring back the bird so they are kept separate.

One solution for keeping the seed from being eat would be to move it so its always left with the cat, since the cat has no interest in the seed.

**Evaluating the solutions:**

Does solution one work? Yes because it keeps the cat and bird separate from each other.

Does solution two work? Yes because it prevents the bird from getting access from the seed so it cannot eat it. Since that cat is not interested in the seed it will not touch it.

I do believe that the solutions will work for all cases since it will effectively let the items be moved without being harmed.

**Choose a solution:**

The ending solution is a combining of the above solutions. First we move the bird across the river. After that we move back across to pick up the cat. We bring the cat across then pick up the bird again. This prevents the cat being alone with the bird so it will be safe. We bring the bird back across and leave it there picking up the seed. This prevents the bird and cat being alone and the bird being alone with the seed. We drop the seed off on the other side. Since the cat has no interest in the seed it will leave it alone leaving the seed safe. We return to pick up the bird and bring it across. Thereby crossing the riving with no complications.

I didn’t really try many test cases. I have been told this one before or something very similar, so I solved it rather quickly, which is why the sub solutions are part of the same one. I solved it before I got to that point. For a bit I forgot that I could only have one item in the boat at a time, but once I remembered that the solution was clear.

**Problem 2:**

So you need to find socks in a drawer in the dark. Since it is dark you cannot see them until you pull them out of the drawer. In the drawer there are 20 socks in total, 5 pairs are black, 3 pairs are brown, and 2 pairs are white. You need to find out what the minimum number of socks needed to get at least one matching pair and at least one matching pair of each color.

Firstly the numbers are sort of deceiving. Firstly it starts out with a total number of socks. Then it breaks down the colors by counting them by twos. If you aren’t paying attention the numbers might throw you off. Next it appears that all the socks are not in pairs in the drawer. Instead they are laying by themselves so you might pick up one black and one brown sock instead of a pair.

The overall goal is to find the lowest number of socks needed to get one matching pair and how the lowest number of socks needed to get one matching pair of each color.

**Breaking the problem apart:**

One of the constraints is the fact that you are in the dark. You cannot find the socks easily. Instead it is random on what color you will pull out of the drawer. The next constraint is the number of the socks. You have more black than brown and more brown than white. Not only do you have a random chance of what color, but you also have a lower chance of getting brown and an even lower chance of getting white.

I would say a sub goal would be to figure out the ratio of the socks. Another sub goal would be to find the chance of getting each color of sock when you reach in and pull one out of the drawer.

**Potential solutions:**

So from the research I did it looks like the ratio of black socks would be 1:1. The ratio for brown would be 6:14, and the ratio of white would be 4:16.

The chance to get black would be 50% and the chance to get brown would be 30% and the chance for white is 20%.

**Evaluation of Potential solutions**

Solution one does solve sub problem 1, but I’m not sure how beneficial it is to the over all goal. I don’t think finding ratios is very useful here and so doesn’t work in every situation.

Solution two does solve sub problem 2. I think chance is key to the over all solution. Chance wont work in every situation though, because sometimes you are simply not dealing with chance.

**The solution**

I honestly do not know. I don’t really understand how to solve this. My best guess is 4 for solution A and 12 for solution B, but I honestly couldn’t really explain it. These are my best guesses.

After some discussion with my friends we came up with 4 for A and 18 for B. I was totally thinking about this in correctly it appears. Here my solution ended up being talking to my friends because I couldn’t clearly see what was needed. Thanks to my friends we were able to figure out exactly what the question was and find the answer.

**Problem 3**

So a little girl counts on her left hand starting on her thumb to her little finger. Her little finger is 5 then she starts going backwards with her ring finger being 6 and her thumb being 9. The question is what finger would end on if she counted to 10, and if she stopped at 100, and if she stopped at 1000.

So there is a pattern here. Now the idea I think would be to understand the pattern and then to be able to predict it. Also in the question it give the answer to A, “…after which she calls her first finger 10 and so on.”

I think the overall goal is to be able to predict on what finger she will end up by following the pattern.

**Breaking the problem apart**

So the constraint here is the method of counting.

I think there is only one sub goal here and that is to understand the counting pattern.

**Possible solutions**

I think there are a couple of potential solutions here. One being I could finger count and know for certain what finger she would end on. I could try and understand the pattern.

**Evaluating Solutions**

While finger counting would work. It would be way to time consuming to be practical. Because of practicality understanding the pattern seems to be the best choice.

I think both solutions would work for any situation, but counting would be to time consuming making it very impractical.

**The Solution**

So I’m going attempted to identify the pattern. So there is only 5 places a number can fall. I talked to my friend for a bit about the problem and he pointed me to modulus. I don’t think I fully understand modulus, but I think it helped me understand the solution a bit better. The pattern seems a little too complicated for me to fully grasp. So what I ended up doing was this. Seeing that 10 divided by 5 is 2 and when counting the way she is it ends on the second finger I decided to apply this concept to the other numbers. So 100 divided by 5 is 20. Unfortunately we don’t have 20 fingers so I divided 20 by 5, which makes 4. So my guess for B is the ring finger. So again following the same line of logic I divided 1000 by 5, which is 200. Again we don’t have 200 fingers. So I divided 200 by 5 again to get 40, and then I divided 40 by 5 to get 8. Unfortunately we don’t have 8 fingers so I again divided 8 by 5, which leaves us with 1.6, or does it? If my friend was correct about modulus that would actually make the answer 3. Because 8 divided by 5 is 1 with a remainder of 3. And according to how modulus words, to the best of my understanding, you divide the number then the mod is the remainder. So my answer for C is the middle finger.

I tested for my answer for B, which I answered as the ring finger. I counted out 100 on my fingers following the pattern that the little girl did. Doing so twice landed me on my ring finger. I didn’t test for C and could be wrong. Testing for C would take more time and concentration than I have.