A Cat , a Par r ot , an d a B ag of S eed:

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, 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.

Defining the problem:

The main problem here is how to transport all three items across the river. With that we also have a cat hat if left alone with the bird may eat him, and seeds the bird will definitely eat if left alone with them. So our goal if the get everything across, and our constraint is all three things must remain separate (The cat, the bird, the seed)

Possible solutions:

The obvious solution is to not leave the cat with the bird or the bird with the seed.

1) Take cat across- this would leave the bid and seed alone. The bird would consume the seed and we’d have failed our goal.

2) Take bird across- this seems like the logical answer till you realize that at some point either the cat and bird or the seed and bird will have to be left alone.

My solution:

Seeing as an amount of trips across the river aren’t specified, we can assume we can make as many trips as necessary. I’d solve it like this:   
  
First I’d take the bird across to the other side and leave it there. Next I’d go get the seed, but I’d take the bird back across the river with me and leave the seed. After that I’d take the cat but leave the bird. When I reach the other side with the seeds, I’d leave the cat and return for the bird. This was everything gets across and nothing is anyone’s dinner. It would look like this:

1) Take the bird across first. This leaves the cat with the seed and puts both the bird and the seed out of risk.

2) Take the seed across. Now it looks like we’d be leaving the seed with the bird, but on our return trip we’d…

3) Take the bird back across the river. This elements the pairing of the bird and the seed.

4) Take the cat across. This time we leave the cat with the seed.

And finally…

5) Take the bird back across the river.

So that’ s how I’d solve that problem. The cat, bird, and seed have arrived at the other side of the river intact.

Sock s in t h e D ar k :

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 getting the following?

The Problem:

We have 20 socks in total. 5 pair of black, 3 pair of brown, and 2 pair of white, giving us 10 black socks, 6 white socks, and 4 white socks. We want to be able to match pairs without having any visual aids, just on probability alone. What’s not readily apparent form the question is the actual number of socks in the draw, which we’ve established is 20. We want to be able to have matching pairs of socks and we want to accomplish this in the smallest number of draws possible. So to answer the first question

A) What is the smallest number of socks that need to be drawn to get one matching pair?

That answer is 4. If you draw 4 socks from the draw you’ll get at least one matching pair because doing so will give you at least two socks of one color. I came to this conclusion rather quickly as there’s only 3 pairs of socks in the draw. If you draw 4 then your bound to draw at least one matching pair.

B) What is the smallest number of socks you could draw to have at least one matching pair of each color?

This is a much harder problem, as there are only 4 white socks. If we average it out we’d get 6.6 times. While this is mathematically correct the odds would still not be in our favor and the potential to fail our go in my opinion the answer is 10 times. With ten draws you’d have at least 1 pair of black socks, one pair of brown socks, and one pair of white socks.   
  
Testing:   
  
I actually did this with 5 pair of white, 3 pair of black, and 2 pair of brown. While the colors are different I came to about the same numbers after a few attempts. The first question, drawing one matching pair, was successful on my first attempt. The second however failed when I drew 6 and then 7 times. At ten times the results were very consistent over multiple attempts.

Pr edict in g Fin ger s:

A little girl counts using the fingers of her left hand as follows: She starts by calling her thumb 1, the first finger 2, middle finder 3, ring finger 4, and 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?

a) What if the girl counts from 1 to 10

b) What if the girl counts from 1 to 100

c) What if the girl counts from 1 to 1000

So we have a little girl that doesn’t use her other hand to count, She counts using only one hand and, starting on the thumb, works her way to the pinky, which is 5, and then alternates, calling her ring finger 6 and so on till the thumb becomes 9 and the index finger becomes 10. What’s not readily apparent is for every group of 10 we’ll be skipping over 2 fingers. That means while the index was 10 In our first group, the ring finger will be 20 in our next grouping. This is very important to remember when answering these questions. So on to the questions:

A) This question is answered for us right in the word problem. She’ll be stopping on her index finger for 10.   
  
B) Using the pattern of alternating fingers we can predict which finger she’ll land on by starting on the index finger and counting two fingers over to represent groupings of 10. If we use this then we’ll land on the ring finger when counting to 100.

C) The number may change, but he method is still the same. We’ll do this in groupings of 10 again. We already know that 100 lands us on the ring finger, so 1000 would land us on the index finger.   
  
Testing:

I bet you’re wondering if I counted out to 1000. Well I did, but only after figuring out there was a pattern when counting in multiples of 10. I looked very silly checking my numbers but my son found it rather amusing. Mathematical models are wonderful tools but sometime you just have to get your hands, or in this case fingers, dirty.