**Problem 1**

A Cat, a Parrot, and a Bag of Seed: A man finds himself on a riverbank with a cat, a parrot and a bag of seed. He needs to transport all three to he 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

**The problem** is that the Cat, Parrot and seed need to be transported across the river without one eating the other.

**The breakdown:** The Cat can never be alone with the Parrot

The Parrot can never be alone with the seed

Only one item in boat at a time

**Potential Solutions:** Bigger boat

Enlist help

Bring item in peril back on second trip

**Evaluation:** A bigger boat would prevent situation in future, but not an immediate solution

Help might solve the problem, but cannot be guaranteed in the future.

Bringing the parrot back after dropping off the seed is a solution that will work and can be maintained.

**Solution:** First cross with the Parrot, as it is the only item that cannot be left with any other. Leave the Parrot on the other side and return for one of the other two, it doesn’t matter which. Once he has crossed with either the seed or the Cat he must return with the Parrot, as it cannot be left with either the seed or the Cat. Trade the Parrot for the last item leaving the Parrot alone on the first bank. Now that the Cat and seed are safely across he is free to return for the Parrot.

**Tests:** Starting with anything other than the Parrot ends in either a dead Parrot or no seed. Leaving either the cat or the seed with the Parrot on the other side is just as disastrous. No choice, bring Parrot back.

**Problem 2**

Socks in the Dark:

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:

a) At least one matching pair

b) At least one matching pair of each color

**The problem**: unable to see socks, don’t know color until choices are made. Might pick same color until that color is exhausted. Must assume worst case scenario

**The breakdown:** how many to get a pair

How many to get three different color pairs

**Potential Solutions:** start with largest number and count until you get a pair. Once largest number of one color is exhausted continue with second largest number then once you have exhausted second largest number of one color take two more and voila.

Assume that each sock is a different color until you have pulled one pair

**Evaluation:** the first solution only works for finding all three

The second solution works for finding one pair

**Solution:** For one pair assume each sock is a different color until you have picked one from each color and the next will guarantee a pair, so four.

For all three pairs assume that the first ten socks are black then the next six brown the next two will guarantee a pair of all three colors, so eighteen.

**Tests:** if I pullless than fourI risk having one of each color and no pairs.

If I pull less than eighteen I risk having five pairs of black three pairs of brown and only one white sock.

**Problem 3**

Predicting Fingers:

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

**The problem:** If girl counts using the fingers on her hand not counting the end fingers twice resulting in an eight count for the hand. Multiples of eight landing on the index finger. As well as multiples of eight with two added.

**The breakdown:** must find closest multiple of eight to number

Figure out how to close the gap

**Potential Solutions:** assign each finger a number to add to multiple of eight

Just count on my fingers

**Evaluation:** Just counting would take too long and to much chance for error.

Assigning numbers to fingers requires two fingers to have two numbers

**Solution:**  Divide number by eight count out remainder by hand

1. first finger
2. 100/8 = 96 with remainder of 4 ring finger
3. 1000/8 = 125 no remainder first finger

**Tests:**