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 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.

1)

Define the problem: to figure out how can a man transport three items (cat, parrot and a bag of seed) to the other side of the river one item at a time and making sure that nothing gets eaten without his presence.

What is not obvious from reading the problem is that the man not only can transfer an item to the other side of the river, but he could also bring that item back to its original place when traveling back for the other items.

The overall goal is to think abstract in order to figure out the plan for transporting every item safely.

2) Break the problem apart

Constraints: 1) A man can only transport one item at a time in the boat.

2) Some items can get eaten if left together unattended.

Sub-goals: 1) To make sure that the items that can get eaten don’t stay alone with items that can eat them.

3) Identify potential solutions

1. Parrot should never stay alone with cat
2. Parrot should never stay alone with a bag of seed.
3. Since parrot can not stay alone with all items, it should be transferred first.
4. After transferring parrot, it does not matter whether a cat or a bag of seed is transferred next to the other side. Nevertheless, after placing a cat or a bag of seed on the shore the parrot should be taken back on the boat to transfer it to the original shore to avoid something being eaten.
5. After placing the parrot on the original shore the third item should be taken and transferred to the other side.
6. Last step, would be to travel back to get the parrot.

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.

Problem #3

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