**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.

Defining the problem:

The problem is that the cat, the parrot and the bag of seed cannot be left by themselves unsupervised, in order to ensure the cat does not eat the parrot and the parrot does not eat the bag of seed. The word problem does not state how many trips the man is allowed to take back and forth across the river. The main goal is to get the cat, the parrot and the bag of seed to the other side of the river.

Breaking the problem apart:

The man must get the cat, the parrot and the bag of seed to the other side of the river, without leaving the cat alone with the parrot or the parrot alone with the bag of seed. The man can only carry one item to the other side in his boat per trip. The constraints are that if he leaves the cat alone with the parrot, the cat will eat the parrot, if he leaves the bag of seed with the parrot, the parrot will eat the bag of seed. The sub-goals are to get the cat across the river, get the parrot across the river and to get the bag of seed across the river.

Identifying potential solutions:

One potential solution could be to take the parrot over first, come back and get the cat, take the cat over and then bring the parrot back across the river and take the bag of seed over to the cat then come back across and get the parrot and take the parrot over consisting of 7 trips back and forth.

Another solution could be to take the parrot over first, then come back for the bag of seed. Take the bag of seed over and bring the parrot back, the take the cat over to the other side, and finally come back to take the parrot over also consisting of 7 trips back and forth.

Evaluating the potential solutions:

Both solutions meet the goals of transporting all items across the river one at a time so that the cat is not left alone with the parrot and the parrot is not left alone with the bag of seed. Both solutions work for all cases because the cat is never alone with the parrot and the parrot is never alone with the bag of seed.

Choosing a solution and developing a plan to implement it:

The man should first load the parrot into the boat and transport it across the river leaving behind the cat and the bag of seed. Once across the river the man should unload the parrot and continue his trip back across the river. The man should then load the cat and transport the cat across the river. Once at the other side the man should unload the cat off the boat and load the parrot back onto the boat and transport the parrot back to its original location leaving the cat behind. Once back to his original location the man should unload the parrot off the boat and load the bag of seed onto to the boat and continue across the river. Once he is at his destination the man should unload the bag seed leaving it behind with the cat and continue alone to his original location. Once back at the man’s original location he should load the parrot and transport the parrot to the other side of the river.

**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.*