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** 
  + a)  How can the man get himself, the cat, the parrot, and the bag of seed to the other side of the river?
  + b)  The problem really isn’t getting across the river, but getting all three across the river intact.
  + c)  The overall goal is to get everything across the river, intact.
* 2)  **Break the problem apart**a) What are the constraints?   
  The cat and the parrot cannot be alone together.   
  The parrot and the seed cannot be alone together.   
  The boat has only room for the man and one other “item.”   
    
    
  b) What are the sub-goals?  
   Keeping the cat and the parrot apart.  
   Keeping the parrot and the seed apart.
* 3)  **Identify potential solutions**

a) For each of the sub-problems you’ve discussed in #2, what is a possible solution?  
  
The solution is to bring one or more of the items on more than one trip, so that he does not leave each item alone individually.

* **4)  Evaluate each potential solution** 
  1. a) Does each solution meet the goals?    
     1. Yes.   
          
        b) Will each solution work for ALL cases?   
          
        Yes.
* **5)  Choose a solution and develop a plan to implement it.** a) Step one – The man brings the parrot across and then rows back alone to the 1st shore.  
    
  Step two – The man brings the seed across and then rows back to the 1st shore with the parrot  
    
  Step three – the man leaves the parrot on the 1st shore and brings the cat back, leaving it on shore with the seed before rowing back alone.   
    
  Step four – The man gets the parrot on the 1st shore, and rows back to the 2nd shore, getting himself, the parrot, the cat, and the seed there successfully.
* b) Describe some test cases you tried out to make sure it works.   
  My testing consisted solely of examining each step to ensure that each fit the rules of the situation, and that in no case were non-compatible items left alone together. These being achieved, it was determined that the situation worked.

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.***1)  Define the problem** 
  + a)  There are an uneven number of socks, in three colors, that must be selected in the dark so to provide A) One matching pair, and B) one matching pair of each color.
  + b)  There are 10 black socks, 6 brown socks, and 4 white socks in the drawer. To accomplish both goals, a minimum of six socks must be selected. The problem does not suggest that it is outside of the problem’s parameters to put back
  + c)  What is the overall goal?   
    To determine the minimum number of socks required to guarantee that you have, in the end, selected a pair of white socks, a pair of black socks, and a pair of brown socks.
* 2)  **Break the problem apart**
* a) What are the constraints?   
  The pairs must be selected in the dark, and checked until both socks are selected.
* b) What are the sub-goals?

Repeat the above process until first a matching pair has been selected, and then repeat the above process until a pair of each color has been selected.

* 3)  **Identify potential solutions**

a) For each of the sub-problems you’ve discussed in #2, what is a possible solution?  
  
Choose two socks, check them to see if they’re a pair, return them if they are not.

* **4)  Evaluate each potential solution**  a) Does each solution meet the goals?  b) Will each solution work for ALL cases?
* **5)  Choose a solution and develop a plan to implement it.**  a) Explain the solution in full. b) Describe some test cases you tried out to make sure it works. (You can include  drawings and diagrams as part of your explanation as long as they are clearly communicating the solution).

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