**A Cat, a Parrot, and a Bag of Seed:**

In this scenario, the problem the man faces is getting the cat, parrot, and the bag of seed to the other side of the river without losing any one of them but only being able to transport one at a time. Since cats eat birds and birds eat seed, the animal and its food cannot be left alone. Since the cat and the seed have no interaction, this is the relationship that will be advantageous to solve this problem.

The first constraint is that the cat will eat the bird in the man’s absence. The second constraint is that the bird will eat the seed in the man’s absence. The sub goals are getting each animal across, which is simple enough to consider.

To get the cat across, the seed must be on the opposite side of the river from the bird. This means that the seed must already be separated from the bird. To get the seed across, the cat must be on the opposite side of the river from the bird, which means that the bird must be on the other side of the river before the seed can move. The bird can simply be taken over without any obstacles.

Each solution meets the goals of the problem and each solution will work in all cases, so long as the constraints are met.

The first step is to take the bird over to the other side of the river, leaving the cat and seed together on the starting side. The second step is to go back to the cat and seed and select either object. The third step is to leave the thing taken in step 2 and take the bird back to the starting side. Swap the bird for the remaining item (the cat if seed was taken in step 2, the see if the cat was taken in step two) and return to the other side. This puts the cat and the seed on the other side of the river. The final step is to go back and retrieve the bird.

**Socks in the Dark**

The problem is picking out a matching pair of socks without being able to see them. The difficulty of this task will depend on the organization of the socks (i.e. are they loosely tossed in there, stacked by matching colors, folded together to form a pair, etc.). The arrangement of the socks will affect the solutions.

The first constraint is that we desire matching pairs of socks. The second constraint is that there are three different colors of socks to choose from. The sub goal is to pick out socks.

To guarantee one matching pair: If the socks were tossed in the drawer in a chaotic fashion, it would take pulling out 4 individual socks to guarantee a matching pair. Since there are three colors, the first three picks could all be different colors, ensuring that there will be a match with the 4th pick, no matter the color selected. If they were stacked, it would take pulling 2 socks out from the same pile. If they were folded together inside of each other it would take grabbing one sock ball, which is 2 socks.

To guarantee one matching pair of each color: If the socks were tossed the drawer in a chaotic fashion it would take pulling out 18 socks to guarantee a match of all three colors. Since there are 10 black socks and 6 brown socks, it is possible that the first 16 sock selections will be all of the black and brown socks, meaning that 2 more must be selected in order to guarantee a pair of each color. If the socks are stacked in matching colors and each color only had one stack of socks, then it would only take 6 socks because you could pull 2 from each pile and have a pair of each color. If they are folded into sock balls, it could take 18 as well unless the socks were also arranged by color in the drawer.

**Predicting Fingers**

The problem is to determine which finger the girl will stop counting on based on the method she is using to count. It is immediately apparent that she is skipping little finger on her second hand, meaning that each full count through her fingers is only 9.

The first constraint is that there are 9 fingers. The second constraint is that after all nine have been used, the girl counts in the same order starting over with the first finger.

One solution would be to make a spreadsheet with columns representing fingers and rows representing the number of times each finger has been counted. Another solution would be to manually count it out. A third solution would be to divide the desired number by 9 and then count the remainder on the fingers to find out.

1. 10/9 = 1 remainder 1, so she stops counting on her 1st thumb
2. 100/9 = 11 remainder 1, so she stops counting on her 1st thumb
3. 1000/9 = 111 remainder 1, so she stops counting on her 1st thumb