Problem 1 - A Cat, a Parrot, and a Bag of Seed:

The problem is that the man needs to transport each item across the river and he doesn’t have the space to do so in one trip. The man will have to have a solution that involves bringing one item at a time, but not leaving two items behind that will consume one another.

The constraints of the problem are limited to having space on the boat to only bring one item at a time with the man across the river. A second constraint is being able to leave two items alone while transporting across the river that could consume the other. The sub-goal will be evaluating what two items can be left behind and what two items can be left together on the other side.

The only potential solutions are to leave the cat and the seed together without one of the items being consumed. There are not any other options to pair the items together.

The potential and only solution would not meet the goals for the man. Once the man took the parrot across the river he would leave the cat and seed behind. His next trip would involve taking the cat or seed with him. Which in either event would end with an item being consumed. If he took the seed on the second trip, it would be consumed by the parrot when he went back to get the cat. If he took the cat on the second trip, the cat would consume the parrot when going back for the seed. The only option the man has is to lose one of the items.

In order to test the accuracy of the theory above the break down of each avenue is below:

Cat = c;

Parrot = p;

Seed = s;

In order for the solution to work c&p or p&s can’t be together.

Theory 1

Man takes c leaving p&s together = Unsuccessful

Theory 2

Man takes p leaving c&s together = Successful

Man takes c leaving s behind and going to p = Successful

Man leaves c&p together and going to s = Unsuccessful

Theory 3

Man take s leaving c&p together = Unsuccessful

The 2nd theory has a shot at being successful initially, but is not able to be completed as there is no way to get through the three items without leaving two together that would consume one.

Problem 2 - Socks in the Dark:

The problem is breaking down all of the odds of every scenario that can occur when picking a sock in the dark. There is a guaranteed solution for each to occur, but to resolve this problem is to break down *when* it will occur.

The constraints are finding out the how many different outcomes can occur when dealing with random selections. The sub-goal will be to find tools or equations that will deliver those outcomes in an efficient manner.

4w = white

6r = brown

10l = black

A potential solution without testing would be to look at it without extensive math equations. A simple demo by picking one at a time I would presume that you would get to one matching pair by the 4th pick because at that point you would have to have at least 2 of the same kind. I would presume that you would have to get to a matching pair of each color by the 18th pick as the worst-case scenario.

For the solution of achieving one pair:

There are a total of 20 socks. If the first pick was:

w

2nd pick was:

r

3rd pick was:

l

On the fourth pick it would guarantee a matching pair no matter what color was picked. No matter what avenue one would go of starting with any color, by the 4th pick it would have to be a matching pair.

In regards to getting a matching pair for each color:

There are a total of 20 socks. If the first pick was:

l = black;

the potential for the next 9 picks could be l, leaving 10 more socks and only one pair currently.

If the 11th pick was:

r=brown;

the potential for the next 5 picks could be r, leaving 4 more socks and only 2 pairs currently.

The 17th pick would have to be:

w = white;

the remaining socks are all w, meaning the 18th pick would have to guarantee a pair of each socks by that pick.

Problem 3 - Predicting Fingers:

The problem is identifying what finger the girl will land on with multiple outcomes. The main problem will be identifying exactly how her counting method is constant to allow for an efficient solution.

The constraints are that the little girl has used a system that has difficulty testing and seeing from a simple demonstration without the potential of an error occurring. The sub-goal will be to come up with a method of applying her system to an equation with variables to simplify toward the solution.

Thumb = t;

First finger = f;

Middle finger = m;

Ring finger = r;

Little finger = l;

t=1, 9, 17, 25, 33 - every 8 (all odd)

f=8, 10, 16, 18, 24 – every 2 & every 6 (all even)

m=3, 7, 11, 15, 19 – every 4 (all odd)

r = 4, 6, 12, 14, 20 – every 2 & every 6 (all even)

l=5, 13, 21, 29, 37 – every 8 (all odd)

In coming up with a pattern toward a solution, I’ve identified a pattern for each finger; which may help toward a solution.

In identifying the pattern, the likely-hood of the solution is that 10, 100, & 1000 will land on the ring finger or the first finger. They are all even numbers and the pattern for those two fingers are the only even numbers to pan out in the little girl’s counting method.

In attempting to see a differential between the two fingers, I’ve updated further numbers down the line.

f=8, 10, 16, 18, 24, 26, 32, 34, 40, 42, 48

r = 4, 6, 12, 14, 20, 22, 28, 30, 36, 38, 44

In expanding the numbers further, the only benefit I had with this is confirming that the first number in each set + 8 will give you the rest of the numbers. The same occurred with the second number in each set, the same with the thirds set, and so on.

ie:

f = f + 8;

r = r + 8;

first finger = 10

first finger = 1000

ring finger = 100

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).