**A Cat, a Parrot, and 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) Do this in your own words.

The man can’t fit all his items in his boat. And he can’t leave certain items alone or they will get devoured.

b) What insight can you offer into the problem that is not immediately visible from the word problem alone?

Assuming the items are to be intact when they get to the other side.

c) What is the overall goal?

To get all 3 items to the other side of the riverbank intact.

**2) Break the problem apart**

a) What are the constraints?

The boat can only carry the man and one other thing. The cat could eat the parrot if left alone. The parrot could eat the seed if left alone.

b) What are the sub-goals?

Not leaving the wrong items alone together.

**3) Identify potential solutions**

a) For each of the sub-problems you’ve discussed in #2, what is a possible solution?

1) Take parrot across the water and leave it. Return. Take cat across the water and leave it. Return with the parrot and leave it. Take seeds across the water and leave them. Return. Take parrot across the water. Now all 3 items are across the water intact

2) Take the parrot across the water and leave it. Return. Take the seeds across the water and leave them. Return with the parrot and leave it. Take the cat across the water and leave it. Return. Take the parrot across the water. All 3 items are across the water intact.

**4) Evaluate each potential solution**

a) Does each solution meet the goals?

Yes it does, everything gets across intact.

b) Will each solution work for ALL cases?

Each solution will work for the 2 solutions as mentioned.

**5) Choose a solution and develop a plan to implement it.**

a) Explain the solution in full.

If you take the parrot across first, then the cat won’t eat the seeds. Next you will need to bring the cat across and take the parrot back so that way the cat won’t eat the parrot. Leave the parrot, but bring back the seeds because the cat on the other side will not eat the seeds. Go back and get the parrot and now you have all 3 on the other side.

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).

I found a game on <http://www.mathcats.com/explore/river/crossing.html> that is similar to this problem. I played the game until I was able to figure out the solution. The cabbage= the seeds. The wolf= the cat. The goat= the parrot. Once I was able to get all 3 items to the other side I knew I had the solution and tried it a few more times to make sure It was right.

**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) Do this in your own words.

Selecting pairs of socks in the dark.

b) What insight can you offer into the problem that is not immediately visible from the word problem alone?

That the socks are in pairs because that’s how I always put my socks away.

c) What is the overall goal?

To pick the correct pairs of socks in the dark.

**2) Break the problem apart**

a) What are the constraints?

Picking pairs of socks in the dark and only checking them after a selection has been made.

b) What are the sub-goals?

At least one matching pair. At least one matching pair of each color.

**3) Identify potential solutions**

a) For each of the sub-problems you’ve discussed in #2, what is a possible solution?

Potential solution for at least one matching pair would be just grab any pair of socks in the drawer since they are already paired up. A potential solution for at least one matching pair of each color could be to grab 9 pairs of socks.

**4) Evaluate each potential solution**

a) Does each solution meet the goals?

Yes each solution meets the goals.

b) Will each solution work for ALL cases?

Each solution works for all cases.

**5) Choose a solution and develop a plan to implement it.**

a) Explain the solution in full.

My solution for having at least one matching pair of socks is to grab any pair from the drawer. Since all socks are already put in pairs it doesn’t matter what one you grab.

My solution for at least one matching pair of each color would be to grab 9 pairs from the drawer. That way you will be assured of ending up with one pair of each color and can put the socks you don’t need back after you check them. For example if you grab 9 pairs of socks you could get 5 pairs of black 3 pairs of brown and 1 white pair. No matter what if you grab 9 pairs you will 100% get one of each color.

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).

I tried my methods out by using my own drawer with socks. I used 5 white pairs of socks, 3 black pairs of socks, and 2 pairs of purple socks. I tried picking 9 pairs with my eyes closed 5 times. Each time I came out with at least 1 pair of each color.

**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

**1) Define the problem**

a) Do this in your own words.

If she continues to count in this manner what finger will she stop on.

b) What insight can you offer into the problem that is not immediately visible from the word problem alone?

She is counting sequential instead of by 5s

c) What is the overall goal?

The overall goal is to predict what finger she will land on by counting sequentially.

**2) Break the problem apart**

a) What are the constraints?

The constraint would be counting a specific way to get the correct answer.

b) What are the sub-goals?

The sub-goals are finding what figure you would stop on if you stop at 10, 100, and 1000.

**3) Identify potential solutions**

a) For each of the sub-problems you’ve discussed in #2, what is a possible solution?

a) Index finger b) ring finger c) index finger

**4) Evaluate each potential solution**

a) Does each solution meet the goals?

Yes each solution meets the goals.

b) Will each solution work for ALL cases?

Yes I have determined which finger she will stop on.

**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).

a) b) 1-10= index finger 1-100= ring finger 1-1000 would end on your index finger. How I got these answers is by simply using my fingers. I counted to 100 using the method given and ended on my ring finger. So for 1000 I continued to count to 200 that ended on my index finger, then I counted to 300 that ended on my ring finger, then 400 that ended on my index finger. After seeing a reoccurring pattern I wrote on paper what 500, 600, 700, 800, 900, and 1000 would be.