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**Class: Scalable Data Infrastructures**

**Activity: Problem Solving**

**Problem 1:**

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

1) Define the problem

a) Define the problem in your own words: A man needs to cross the river but he has a cat, parrot and a bag of seed to bring with him. His boat can only carry one at a time. So which one should he take first?

b) What insight can you offer into the problem that is not immediately visible from the word problem alone? That there are other solutions than what he is pointing out in the problem or other groups that can go together other than the two stated.

c) What is the overall goal? The overall goal is to get the man, the cat, the parrot, and the seed to the other side of the river and still have all present.

2) Break the problem apart

a) What are the constraints? That if the cat and parrot are left alone the cat will most definitely eat the bird and if the parrot and the seed are left alone the parrot will most definitely eat the seed.

b) What are the sub-goals? To make 3 trips and still have the cat, parrot and seed when the man reaches the other side of the river. So all three trips need to be defined as the solution.

3) Identify potential solutions

a) For each of the sub-problems you’ve discussed in #2, what is a possible solution? The possible solutions are for the first trip the man can take him and the parrot. For the second tip he could take him and take the seed. For the third trip he could take the cat.

4) Evaluate each potential solution

a) Does each solution meet the goal? Yes

b) Will each solution work in all cases? No

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

a) Explain the solution in full.

The full solution for this problem would be to:

First trip take the Parrot go back to side A

Second trip take the seed once at side B drop the seed and pick up the parrot

Third Trip take cat to side B and leave parrot at side A

Fourth Trip take parrot to side B

b) The main problem was determining how many trips would be needed in order not to leave the two together that would not get along. So four tips is the required amount for all items to end up on side B.

**Problem 2**

**Socks In the Dark**

1. Define the Problem
   1. There are 20 socks in the drawer. There are 10 black socks, 6 brown socks and 4 white socks. If you can’t turn on the light how many sock pairs will you need to grab in order to get a matching pair?
   2. The goal is to get a matching pair of socks in the dark.
2. Break the problem apart
   1. The constraints are that you cannot turn on the light and you won’t know what socks you picked until your selection is made.
   2. Sub-goals.
      1. Pick two single socks
      2. Take them to the light to see what colors they are
      3. Try again if they don’t match
3. Identify potential solutions
   1. Picking two socks could certainly be a match but it is not guaranteed that you will have a match
   2. Picking enough socks to make a pair would be a minimum amount that is greater than 6
4. Evaluate each potential solution
   1. Does each solution meet the goals? No
   2. Will each solution work for ALL cases? No
5. Choose a solution and develop a plan to implement it.
   1. The solution would to pick out 8 pairs of socks. With there only being 4 white, and 6 brown picking out 8 pairs of socks will guarantee that you will have a matching pair in one of the colors. In order to get a matching pair of each color you will need to pick out at least 12 pairs of socks to guarantee that you have a matching pair of each color.

**Problem 3**

**Predicting Fingers**

1. Define the Problem
   1. If a girl is only using her left hand to count what finger would she end up on if she counted to 10, 100 or 1000?
   2. The goal is the predict by her counting method which finger she will end up on when she is done counting to 10, 100, and 1000.
2. Break the problem apart
   1. That these are big numbers to count to so it could take a while to predict which finger she will end up on.
   2. Not messing up when trying to figure it out.
   3. Figuring out the problem to solve this equation.
3. Identify potential solutions
   1. Count on your left hand finger by finger to figure out which on she will be left on.
   2. Figure out what finger she will land on at 10 and do a equation for the remaining questions of 100 to 1000.
4. Evaluate each potential solution
   1. Counting on your hand would work but it will be very time consuming. Plus the margin for error is great and you can easily come up with the wrong answer.
   2. Figuring out the math equation to solve this problem makes so much more sense. By using a Math equation you have a higher percentage of getting the correct answer.
5. Choose a solution and develop a plan to implement it.
   1. The solution I choose is solution b because counting to 1000 on one hand will just be to time consuming. Plus there is so much more room for error than there would be with any other solution.
   2. If the little girl counted to 10, 100 or 1000 she would end up on her first finger.