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Problem Solving Activity

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

1. Define the problem
   1. The problem with this scenario is that the man has to get to the other side of the river but can only bring himself and one other passenger on the boat. He must now choose which one is plausible to bring with him.
   2. The insight that I can offer to the problem is that cats don’t eat seed and parrots can fly.
   3. The overall goal is to get everyone across the river safely without the cat eating the parrot or the parrot eating the seed.
2. Break the problem apart
   1. The constraints are that the man can only have one item inside the boat with him and needs to watch what which items he leaves behind so that the items don’t eat one another.
   2. The subgoals are not to leave the bird with the bag of seed and not to leave the cat with the bird.
3. Identify potential solutions
   1. One solution, you can bring the cat first and risk the bird eating the seed.
   2. You can bring the seed first and risk the cat eating the bird.
   3. You can bring the bird first.
   4. You can make the bird fly while you take two trips. One with the seed and one with the cat.
4. Evaluate each potential solution
   1. No each solution does not meet all of the goals, with the exception of the last solution, at some point you would be leaving two items together that shouldn’t be.
   2. Only one solution will work for all cases, which would be the last solution.
5. Choose a solution and develop a plan to implement it.
   1. The solution I would choose is the fourth solution, which would be to take advantage of the fact that parrots can fly. Make the bird fly alongside the boat while you make two sets of trips carrying one item at a time.
   2. In this solution, no matter which item you bring across the river first it will help to settle both cases. If you bring across the cat first and make the bird fly along then the seed is safe from eating and the cat isn’t left with the parrot. If you bring the seed across first then the same thing is true, the parrot isn’t left alone with the seed nor with the cat.

**Socks in the Dark:**

1. Define the problem
   1. The problem is selecting socks in the dark and the probability of receiving at least one matching pair and at least one matching pair of each color.
   2. The insight I can offer is that there’s ½ a chance of selecting a black pair, 3/10 a chance of selecting brown, and 1/5 chance of selecting a white pair.
   3. The overall goal is selecting the least amount of pairs possible while making the cases true.
2. Break the problem apart
   1. The constraints are that we need to select the socks in the dark at random and that we need to select the least amount of socks possible.
   2. The sub-goals are to select one pair of white (x), one pair of brown (y), one pair of black (z), and another pair of any color.
3. Identify potential solutions
   1. Probability that both solutions will be satisfied within four picks.
   2. Regardless, both will be satisfied by 6 picks.
4. Evaluate each potential solution
   1. Both solutions would work for the sub-goals and overall goal.
   2. Each solution would work for all cases, granted that the probability was in your favor.
5. Choose a solution and develop a plan to implement it.
   1. My solution would be that it would probably take at least 6 tries before getting all of the requirements of the problem.
   2. According to the problem the socks are already in pairs, therefore the possibility of getting the pairings needed is quite high. Although its possible to grab all four you need in the first four, its not probable. But there’s a 94% chance that you can grab them all within six tries. (P=1-2(X\*Y\*Z))

**Predicting Fingers:**

1. Define the problem
   1. The little girl counts using one hand and we must figure out what finger she will land based on three different counting categories.
   2. The insight that I can offer is that every time the girl counts fully on her hand she always hits the 8th number from which she started after the first time through.
   3. The overall goal is finding what finger the girl lands on at 10, 100, and 1000 when she starts counting from one each time.
2. Break the problem apart
   1. Constraints are that we must go back to one every time.
   2. Find the finger the easiest way.
3. Identify potential solutions
   1. Find equation that mathematically gets us to the quickest answer possible.
   2. Count on our fingers the same way the girl does until we find our answer.
4. Evaluate each potential solution
   1. Each solution meets the goals and each solution would work for all cases.
5. Choose a solution and develop a plan to implement it.
   1. Although both solutions are possible, I’m going to choose to come up with an equation and use the counting method for remainders that will work for all three problems and give us the quickest answer.
   2. For this instance, the number we want to land on is going to be N. R is going to be our remainder that we will use to find the finger. We know that every time she counts she stops on her thumb. Well, after the initial pass, every time she lands on her thumb it is only 8 numbers. Here is the solution:
      * + 1. (N – 9)/8 = R (We don’t want a decimal number, we want the number that is left over after dividing 8.
          2. For example, 10-9 = 1, since this can not be divided by 8 then we simply count one more finger and we know that she will land on her first finger.
          3. Example 2, 100-9 = 91, 8 goes into 91 = 11 times which is 88 and we have 3 left over so we know that she will end up on her ring finger.
          4. Example 3, 1000-9=991, 991/8 = 123 w/ 7 remaining. The finger she will land on is the first finger.