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Web Programming Fundamentals

Problem Solving

**A cat, a parrot, and a bag of seed.**

1. Define the problem

A man needs to cross a riverbank with the three items, a cat, a parrot, and a bag of seed but his boat is only big enough to hold him and one item at a time. This causes an issue because certain items can cause harm to other items if the man takes the items over in the wrong order.

One issue that may not be clear is that the man has to control which items are alone not only on the first side but also the second side.

The overall goal is to cross the river without the loss or any items.

2. Break the problem apart

The constraints are if the bird is left alone with the seed it may eat the seed and if the cat is left alone with the bird, the cat may eat the bird. Another constraint is that the boat can only carry one item with the man at a time.

The sub-goal would be to make the minimum amount of trips to bring all the items over without leaving two items that will hurt each other alone.

3. Identify potential solutions

One solution would be to bring each item over avoiding leaving two conflicting items alone by bringing one item back with each cross of the river.

4. Evaluate each potential solution

The solution does meet the goals of crossing the river and the goal of not leaving two conflicting items alone together. The solution will also work in all cases.

5. The solution is to bring the parrot over first to avoid the cat eating the parrot and the parrot eating the seed. Then go back across with just the man in the boat. Then you can bring any of the other two items over. As you leave the second item on the other side of the water, you would then take the parrot back with you. Then you would grab the third item and bring it back across which would leave two items on the wanted side and the parrot on the first side. Then you would go back to the first side with the empty boat and pick up the parrot.

This works no matter what item you bring over second and third as long as the parrot goes first. If you bring the parrot over first the cat will not harm the seed, nor will the seed harm the cat. When you bring the second item over either the cat or the seed will not cause a conflict because you are there to stop it, then bringing the chicken back with you stops a conflict on the second side.

**Socks in the Dark**

1. Define the problem.

A. You have twenty pairs of socks with three different colors in a dark room and you have to find a guaranteed matching pair without using a light.

To guarantee you have a matching pair you will end up with more socks than you need but the overall goal of finding at least one matching pair will be met.

B. You have twenty pairs of socks with three different colors in a dark room and you have to guarantee a matched pair of each without using a light.

To guarantee a matching pair you will have to do the same as the first part of the problem because to guarantee a matching pair of each you will need to pull enough socks to cover each of the colors max quantities.

2. Break the problem apart.

The constraints of each A and B would be that you couldn’t see what you are pulling until after you have already made the choice.

The sub-goal is to pull the least amount of socks to reach your goal rather than pulling the entire drawer.

4. Evaluate each potential solution.

A way to pull the least amount of socks for the first goal of having at least one pair would be to pull four socks. For the second amount you would have to pull at least enough socks to cover the combined two largest colors to make sure you have each color, otherwise you could just have repeats and could not guarantee that you have a pair of each.

A. If you pull four socks you are guaranteed to have a pair every time. Say you pull four of one color then you still meet the one pair goal. If you pull three of the same color and one other then you still reach the goal. If you pull one of each color and have one more sock to pull then no matter what fourth sock you pull it will make at least one match. If you pull less than four you could get one of each color, which would not guarantee that you have a match. This will guarantee you have at least one match every time with minimum excess.

B. In order to guarantee you have at least one pair of each sock you would need to pull enough socks to cover the two largest combined colors and then pull two extra socks to cover the last color. This will leave you will a lot of excess but you will be guaranteed to have at least one pair of each color every time. If you pull one sock less it is possible to be one sock short for a pair even if it is not probable.

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

For each of the problems I cut out slips of paper and labeled them accordingly. I then pulled different amounts of “socks” trying to find out the least amount I was able to pull while reaching the goal. The first goal of one pair or any color was easy enough to pull because there are only three colors therefor you can pull four which will lead to at least one pair if not two. For the second goal, one pair of each color, I had to pull many more “socks” in order to reach the goal every time. If you pull less then you could end up with one pair of two colors and be short of the last colored pair.

**Predicting Fingers**

1. Define the problem.

A girl is counting using her fingers in a sequential method. She will count up to three different goals of ten, one hundred, and one thousand. Each finger will be counted in a manor that the first and last finger will be skipped each round and the other three will be counted each way.

2. Break the problem apart.

The constraints are that you have to account for each of the end fingers to be skipped while counting the inside fingers each way.

The sub-goal is the same as the main goal, which is to reach each count without skipping any numbers.

3. In order to count to each number you could just count your fingers and see which finger you land on.

Another option would be to notice that you lose a finger on the first rotation and then two fingers on every rotation after the first.

4. Evaluate each potential solution.

In order to count each finger it would take some time but you are guaranteed to reach each of your goals with no problem. The issue with this is that it can take a very long time and leaves you with the possibility to mess up the count.

The second solution would be to make an equation, which will help you reach the goal faster, and you could find each goal and other numbers. This will work in each of the three goals set and other goals as well.

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

In order to make an equation you have to factor everything in. The end goal, the first cycle and the cycles in-between in which you lose two numbers.

If you do one cycle its pretty easy to see that you will land on the first finger because you have five fingers and on the first cycle you lose one meaning you will have to go back in one landing on the first finger at the number ten.

If you count to one hundred you will have to calculate the first loss on one finger and the loss of two fingers each cycle after. The first cycle would have 9 and the second would have 8 meaning after 2 cycles you will be at 17 and after three you will be at 25 losing another 2 of the “10” counted fingers.

The goal / Every Cycle after the first x 8 + 9 (the first cycle).

In order to come up with this I used my motorcycles transmission as a base to count. The transmission goes in the same order with the shift count because although there are five gears you only upshift four times to get the fifth gear while driving which if you cycle thru the gears from neutral you would have the same lose of one gear and after you continue riding you would lose two gears per each cycle of shifts due to skipping the neutral gear which would be like the same thing as counting the thumb first and then skipping it in the thereafter cycles.

This leaves you with the girl landing on the pointer or first finger when counting to ten, the ring finger when counting to one hundred and

The best way to solve the problem is to notice the pattern that after the first cycle the thumb lands on every eight number plus the one extra for the start cycle. So 8+1 =9 +8 =17 +8= 25 +8=33 and so on leaving you close to the numbers. So if you needed to get to 100 you would do 100/8 which would be 12.5 so that would leave you at 96 + 1 for the start leaving you at 97 which would place your count on the thumb. Then you just have to count for the remaining 3, which puts you at the ring finger. This works for every number including the 1000, which would be 1000/8 leaving you at 125 cycles. This puts you directly at 1000 and the thumb but you have to account for the +1 of the first cycle so that would place you at 1001 and first or pointer finger due to needed to take a step back in the order to get back to 1000.

Number of cycles x8 +1 Leaves you on the thumb everytime.