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Web Programming Fundamentals, Section 01

Problem Solving

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

1. **Define the problem**
   1. A man must transport a cat, a bird, and a bag of seed to the opposite shore of a river in his boat. He can only transport one item at a time, and must decide in what order to transport them. The cat cannot be left alone with the bird and the bird cannot be left alone with the seed.
   2. One may not notice at first glance that this word problem states the cat *could* eat the parrot and that the parrot *would* eat the bag of seed. One is a possibility, and the other an absolute. The man could decide to leave the two animals together and hope for the best. One must also take into consideration that if he leaves the bag of seed out of his sight, there is nothing to stop any wild birds from feeding on it.
   3. The overall goal of this scenario is to transport all three items to the other side of the river, one at a time, and to choose the correct item to transport for each trip.
2. **Break the problem apart**
   1. The constraints the man faces are the inability to leave the parrot with the bag of seed, the likelihood of the cat eating the parrot, and the ability to only transport one item per trip.
   2. The sub-goals in this scenario are to safely transport each item to the opposite riverbank, and to not leave the wrong items together while transporting the third in his boat. He cannot leave the bird with the bag of seed, and ideally cannot leave the cat with the bird.
3. **Identify potential solutions**
   1. In order to reach his sub-goals, the man would need to first transport the bird to the other side. Once on the other side, he would return for the cat. He would then leave the cat on the opposite side and take the bird on the return trip. He would switch out the bird for the bag of seed, and drop it off with the cat. He would return once more for the bird and transport it to the other side, where the cat and bag of seed await.

Another solution would be for the man to transport the bird, then the seed, return with the bird, take the cat and leave the bird, then return for the bird last.

1. **Evaluate each potential solution**
   1. This solution meets the goals of this scenario. By first taking the bird, the cat is left with the seed. By bringing the cat over second, and taking the bird back with him to fetch the seed, he avoids leaving the cat and the bird together. By dropping off the bird and taking the seed, he will once again pair the cat and seed, and finally return for the bird. All three items will have made it safely to the other side of the riverbank.
   2. I believe the items must be transported in that specific order for the solution to be effective and give positive results.
2. **Choose a solution and develop a plan to implement it**
   1. In order to transport his three items to the opposite shore safely, the man must make several trips. First, he will need to transport the bird, leaving the cat and bag of seed behind. He will then leave the bird on the opposite shore and return for the cat or the bag of seed. He will return, leaving his new item behind, and taking the bird back with him, and switching it out for the remaining item. He will drop off his second item, return for the bird, and then all three items will be on the same shore.
   2. If the man were to transport the cat or the bag of seed first, either choice would leave the bird paired with an unwanted item. Therefore, the bird must be transported first. He must then return for a second item, the choice of which is unimportant. Whether the man returns with the cat or the bag of seed, he will bring the parrot back with him, keeping it safe once again. He will then switch out the parrot for the third item, and return again for the parrot.

Socks In the Dark:

1. **Define the problem**
   1. You must select socks, from a drawer of 20, in the dark, and may only look once they have been selected. You need at least one matching pair, and at least one matching pair of each color. There are 5 black pairs, 3 brown pairs, and 2 white pairs within the drawer. You must determine what is the smallest number of socks your can take to guarantee selecting the required number of pairs.
   2. This word problem makes it seem like you must pick more pairs than you actually have to. You must only pick out 1 black pair, 1 brown pair, and 1 white pair.
2. **Break the problem apart**
   1. The socks must be chosen in the dark, you cannot view your selections until you have chosen them.
   2. The goals are to obtain at least one matching pair and at least one matching pair in each color.
3. **Identify the potential solutions**
   1. You could choose a pair at a time, and check your selection after it has been made. The word problem does not specify how many you must select before viewing.
4. **Evaluate each potential solution**
   1. By choosing two socks at a time, you will not have to take out more socks than necessary to achieve your goal of 1 black pair, 1 brown pair, and 1 white pair.
5. **Choose a solution and develop a plan to implement it**
   1. I would simply choose two socks at a time to ensure I pick out each pair required.

Predicting Fingers:

1. **Define the problem**
   1. A girl uses the fingers of her left hand to count from 1 to 10, 1 to 100, and 1 to 1000. She starts at 1 with her thumb, and ends on her pinky finger with 5. She starts again with 6 on her ring finger, ends with 9 on her thumb. She repeats this pattern until she reaches her goal numbers.
2. **Break the problem apart**
   1. She cannot count on the same finger for each new number, she must move through each finger for each number, and back again.
   2. The goals are to figure out which finger she will stop on at 10, 100, and 1,000.
3. **Identify the potential solutions**
   1. There are several possibilities for solving this scenario. First, the girl could literally take the time to count out on her fingers to see where she falls on 10, 100, and 1,000. Another possibility is that she could come up with an equation to determine which finger she would land on for 10, 100, and 1,000.
4. **Evaluate each potential solution**
   1. These solutions will meet the goal of determining which finger she will land on at 10, 100, and 1,000.
   2. These solutions will work for all three goals, though the first would be more time consuming.
5. **Choose a solution and develop a plan to implement it**
   1. In order to determine which finger she will land on when counting 1 to 10, 1 to 100, and 1 to 1,000, the girl must count out each finger, or come up with an equation to figure out which finger she will land on.