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A Cat, a Parrot, and a 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.

**Define the problem. What is the goal? Any insight that isn’t immediately apparent.**

The goal is for the man to transport all of the items across the river. The problem is that the boat is not big enough to transport all of the items at the same time.

**What are the constraints? Sub-problems?**

A constraint is the size of the boat, which only allows the man to transport one item at a time. Another constraint is that the man is alone. There are two sub problems that are the cat will eat the parrot if left unattended, and the parrot will eat the seeds if left unattended.

**What are potential solutions?**

Potential solutions are to get a bigger boat, to find additional help, or to keep the cat separate from the parrot and the parrot separate from the seeds.

**Evaluate each solution?**

While getting a bigger boat or finding help are the easy answers, nothing in the story makes it seem that they are available options. The remaining option relies only on what the man has available and seems possible.

**Explain the solution in detail.**

The solution would keep the parrot and cat separate and also keep the seeds and parrot separate. The first move would be for the man to transport the parrot across the river. This satisfies both requirements. The man would travel back alone and pick up either the cat or the seeds. He would then transport the item across and pick up the parrot because the parrot cannot be left alone on either bank. He travels across the river with the parrot to drop it off and pick up the item left on the bank. He travels back across and drops off the item. He then travels back alone to pick up the parrot and finally transport it across the river.

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 on matching pair of each color.

**Define the problem. What is the goal? Any insight that isn’t immediately apparent.**

The goal here is to find a matching pair of socks and a matching pair of each color. The problem is you cannot see which socks you are selecting before you leave the room.

**What are the constraints? Sub-problems?**

One of the constraints is you cannot see the socks that you are selecting. A sub-problem is you only want to select enough socks to guarantee a match/ a match of each color.

**What are potential solutions?**

One solution is to turn on the lights. Another solution is to grab enough socks to guarantee a match/ a match of each color.

**Evaluate each solution?**

Having a light source doesn’t appear to be a possible solution based on what is known. Grabbing the minimum amount of socks is possible.

**Explain the solution in detail.**

1. Grabbing enough to have one matching pair is fairly simple. You can only grab 3 socks (a black, a brown, and a white) before you grab a matching sock. So the solution to this is 4 socks.
2. In order to grab a matching pair of each you need to look at each individually. In order to have a matching pair of black socks, you need to select all socks but 4 pairs or eight socks. In order to have a matching pair of brown socks, you need to select all socks but 2 pairs or four socks. In order to have a matching pair of white socks, you need to select all socks but 1 pairs or two socks. So the minimum amount of socks to guarantee a matching pair of each color is 18 socks.

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

**Define the problem. What is the goal? Any insight that isn’t immediately apparent.**

The goal is to determine which finger she will stop on. The problem is that the manner that she counts is slightly irregular.

**What are the constraints? Sub-problems?**

A challenge this problem faces is that the solution should work for any number.

**What are potential solutions?**

A potential solution is to separate the initial rotation, which is 9, from the rest, which is 8. You could also break down her counting into a simpler pattern of 5 to start then 4.

**Evaluate each solution?**

Making the rotation from thumb to thumb or 9 to start then 8 after would work in this instance. Making the rotation from thumb to pinky and then back or 5 to start then 4 after is a bit more complex. This solution would also work but would require more work to implement.

**Explain the solution in detail.**