**Problem 1: A Cat, A Parrot, and a Bag of Seed:**

1) Define the problem

a) A man is take three items safely and securely across a river, with a limited amount of room in his boat. However, in order to do this he must figure out how to do this without losing any of his cargo.

b) The man is going to have to make more than three trips across the river, in order to complete his goal.

c) The man is trying to successfully cross a river with all three items intact.

2) Break the problem apart into smaller problems

a) - The man only has room in his boat for himself and one other item.

- If he leaves the cat and parrot alone, the cat would eat the parrot.

- If he leaves the parrot and bag of seed alone, the parrot would eat the bag of seed.

b)- Get him and the items across safely

- Don’t let the cat eat the parrot.

- Don’t let the parrot eat the bag of seed.

3) Identify the potential solutions

a) – Get a bigger boat.

- Make sure you strategically take the correct items back and forth in order not to lose an item.

4) Evaluate each potential solution

a) - The “Get a bigger boat” solution, is not feasible, since he is on a shoreline and not around a Marina.

- The “Make sure you strategically take the correct items back and forth in order not to lose an item.” Should be the best possible solution for him at this juncture.

b) – If he does several trips, with the correct item, he will successfully complete his goal.

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

a) 1. Take the parrot across the river and leaves him on the other shoreline.

2. Head back to the other shore and pick up the bag of seed.

3. Take the bag of seed across the river and drop it off, and pick up the parrot.

4. Take the parrot back to the other shore and pick up the cat.

5. Take the cat across to the other shoreline, and drop it off.

6. Head back to the other shore and pick up the parrot.

7. Pick-up the parrot and head back for your final trip.

b.) LEGEND:

Cat = C

Parrot = P

Bag of Seed = B

|  |  |  |  |
| --- | --- | --- | --- |
| **SHORELINE A** | **RIVER** | **SHORELINE B** | **TRIP NUMBER** |
| C & B & P | ------------P--------------🡪 |  | 1 |
| C & B | 🡨------------------------- | P | 2 |
| C | --------------B------------🡪 | P | 3 |
| C | 🡨-----------P-------------- | B | 4 |
| P | --------------C------------🡪 | C & B | 5 |
| P | 🡨------------------------- | C & B | 6 |
|  | --------------P------------🡪 | C & B & P | 7 |

**Problem 2: Socks in the Dark:**

1. Define the problem

a) You know you have 5 black, 3 brown, and 2 white pairs of socks, for an overall total of 20 socks in your drawer. You are trying to figure out how many socks you have to take out, in order to get one matching pair, and at least one matching pair of each color. However, you cannot see what color they are until you actually take them out of the drawer.

b) You are going to have to take out at least three socks, in order to accomplish your goals.

c) The overall goal is to know how many socks you must take out, in order to get one matching pair of socks, and one matching pair of each color.

2. Break the problem into smaller parts

a.) - You are in the dark.

- You are only able to see what color the socks are once you take them out of the drawer.

b.) - The sub-goal is to find not just one pair, but a pair of each color.

3. Identify potential solutions

a.) – Open the drawer wider, and turn on the light.

- Pull all 20 socks out of the drawer to pick which ones you want.

- Take out at least four socks to get a single pair.

- Take out 18 socks to guarantee that you have a pair of each color.

4. Evaluate each potential solution

a.) Each of the solutions does not meet the goals. However, the last two will work, for the criteria.

b.) There is no single solution to this problem, in order to achieve both goals; two solutions must be utilized.

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

a.) – In order to accomplish objective “A: At least one matching pair.” You must first start with the knowledge that you have three different color socks. Therefore if you take out a fourth sock, you with have at least one matching pair.”

- In order to accomplish objective: “B: At least one matching pair of each color.” You have to understand that you are looking for a total of six socks out of twenty. Since you also know how many socks of each color you have, you add them up, from largest to smallest amounts. Knowing that you only need two socks from the smallest amount.

b.) LEGEND:

Black sock = B

Brown sock = Br

White sock = W

|  |  |
| --- | --- |
| SOCK COLOR | TOTAL |
| B | 10 |
| Br | 6 |
| W | 4 |

**ONE MATCHING PAIR:**

B, Br, W….. (B, Br, W) will be your next draw no matter what.

**ONE MATCHING PAIR OF EACH COLOR:**

B, B, B, B, B, B, B, B, B, B, Br, Br, Br, Br, Br, Br, W, W = 18 socks total. This is in order to guarantee that you have one matching pair of each color sock.

**Problem 3: Predicting Fingers**

1. Define the problem

a) A child is counting on one hand from one to ten. However, when she is counting she goes from left to right, and then right to left, skipping a second count on her little finger. Example: 1, is the thumb, 2 is the first finger, 3 is the middle finger, 4 is the ring finger, 5 is the little finger, 6 is the ring finger, 7 is the middle finger, 8 is the first finger, 9 is the thumb, and 10 is the first finger.

b) Since she has only made it to the number 10, she should be stopped and shown to count from left to right, everytime.

c) The goal is to see what finger the girl will land on when it comes to the numbers, 10, 100, and 1,000.

2. Break the problem into smaller parts

a.) She is using one hand, and skipping to count her little finger twice when going from right to left.

b.) The goal is to find out in intervals of ten, instead of intervals of nine, where the girl will end up, when she is done counting to goal numbers.

3. Identify potential solutions

a.) She should have started over and shown to count from left to right, each time.

4. Evaluate each potential solution

a) In order for her to learn the proper way to count, and understand that there are five fingers on each hand. Should start over. Therefore, my solution will work

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

a.) When a child is learning to count, they should be allowed to use their fingers. However, they have to also be taught that there are five digits on each hand. Therefore, leaving them with a total of 10 fingers. That is why this little girl needs to be taught to stop and start over. And continue to count from right to left. Like when a typewriter starts over.

b.)

**WAY SHE WAS COUNTING:**

Thumb – 1, 9

First finger – 2, 8, 10

Middle finger – 3, 7

Ring finger – 4, 6

Little finger – 5

**AFTER STOPPING HER AND TEACHING HER CORRECTLY:**

Thumb – 1, 6

First finger – 2, 7

Middle finger – 3, 8

Ring finger – 4, 9

Little finger – 5, 10

**NOTES**

The process:

1. Define the problem

A. Knowing the problem, inside and out is half the battle.

a. What are the assumptions being made?

b. What are the parameters or constraints of the problem?

c. What goals are we trying to meet?

B. Ways to better understand the problem:

a. Try visualizing and drawing it out on paper.

b. Ask someone

2. Break the problem apart into smaller problems

A. Ways to break apart a problem.

a. Identify the main goal of the problem. Then, identify sub-goals.

b. Identify the constraints for each sub-goal.

3. Identify potential solutions

A. Ways to break identify potential solutions.

a. Look at the sub-problems to see if you can create solutions for them.

b. Can you generalize to make the solution work for the whole problem?

c. Don’t worry whether or not they actually work yet. Test them out later.

4. Evaluate the potential solutions to select the best one

A. Evaluating potential solutions:

a. Does the solution meet the goals?

b. Does the solution work for all cases?

c. There may be more than one solution. Rank to see which works best.

5. Develop an action plan to implement the best solution.

A. Implementing the solution

a. How will it work?

b.Test, test, test, test, test!