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.

1) Define the problem – The man needs to cross the riverbank but he doesn’t have enough room in the boat to take the cat, bird and the bag of seed. The cat would eat the bird and the bird would eat the seeds if left behind. Is the boat available to make as many trips needed to transport everything? The overall goal would be to transport everything to the other side of the riverbank, while keeping everything safe.

2) Break the problem apart

a) What are the constraints? In the boat there is only room for the man and one other item. If the man leaves the wrongs one behind, one can eat the other.

b) What are the sub-goals? To bring the item across the riverbank while keeping everyone safe.

3) Identify potential solutions

a) For each of the sub-problems you’ve discussed in #2, what is a possible solution?

Solution 1: Leave the cat and the bag of seed behind and take the cat first.

Solution 2: Sacrifice one of the items and only keep 2 of them safe.

4) Evaluate each potential solution

a) Does each solution meet the goals?

Solution 1 will help meet the goals, while solution 2 will only solve the problem to an extent.

b) Will each solution work for ALL cases?

Solution 1 will solve the cases along with other steps. Solution 2 does not work to complete the goal.

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

a) Explain the solution in full.

The man will take the bird first, this will leave the cat and the bag of seed behind. The man will return and bring the cat with him. On his way back he will bring the bird with him. He will leave the bird and bring the bag of seed. Then he will come back and get the bird.

b) Describe some test cases you tried out to make sure it works. (You can include drawings and diagrams as part of your explanation as long as they are clearly communicating the solution). Bringing the bird first will assure that the cat won’t eat the bird and the bird won’t eat the bag of seed. This way on every trip the cat is either with the bag of seed or by himself and the bird is not left alone with neither the cat or bag of seed.

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 one matching pair of each color.

1) Define the problem – Need to select the smallest number of socks to guarantee getting one matching pair and at least one matching pair of each color.

2) Break the problem apart – It is dark and you cannot see what you are selecting. Sub-goals are to select matching pairs.

3) Identify potential solutions – Grab all the socks at once. Grab half the amount of the socks.

4) Evaluate each potential solution – Grabbing all the socks at once wouldn’t be affective. Grabbing half the amount would give you a 50% chance of getting the desired amount.

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

Grab half the amount of socks, this way you will definitely have at least one matching pair and one matching pair of each color.

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

1) Define the problem – Figure which finger the little girl stops at when counting with her fingers.