1. **Define the problem**
2. Do this in your own words.
3. What insight can you offer into the problem that is not immediately visible from the word problem alone?
4. What is the overall goal?
5. **Break the Problem apart**
6. What are the constraints?
7. What are the sub-goals?
8. **Identify potential solutions**
9. For each of the sub-problems you’ve discussed #2, what is a possible solution?
10. **Evaluate each potential solution**
11. Does each solution meet the goals?
12. Will each solution work for ALL cases?
13. **Choose a solution and develop a plan to implement it.**

a) Explain the solution in full.

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).

**Problems:**

***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 east 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.*

1a) How does the man get the cat, parrot and seed across the river without any of his passengers consuming the other with the limits of his small boat?

1b) He should take them one at a time. Also what is to stop the passengers from consuming each other once on the other side?

2a) He can only fit two people in his boat at one time and his passengers have a food chain hierarchy.

2b) Get passengers across without letting them eat each other. He can’t leave the bird alone with the seed or the cat.

3a) Send the boat across with the cat and seed in it then follow with the parrot.

4a) Yes

4b) Yes

5a) The man should send the boat across with the seed and cat together then follow in the boat with the parrot. The cat will not eat the seed therefore it is safe to send them together. The parrot will be safe with him there along with the seed with the man’s supervision.

5b) The man goes with the cat the first time, the bird eats the seed. The man goes with the bird the first time, takes seed the second time, the birds eats the seed when the man leaves to get the cat.

***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:*

1. *At least one matching pair*
2. *At least one matching pair of each color.*

1a) 5 pairs black socks, 3 pairs brown socks, 2 pairs white. Picking at random what is the least number of selections you can possibly make to get one pair of matching socks? What is the least number of selections you can make to get one pair of matching socks of each color?

1b) There are 10 black socks (50%), 6 brown socks (30%), and 4 white socks (20%)

2a) Selection is made at random, what is smallest number of selections.

2b) Get one matching pair of socks. Get one pair of matching socks of each color.

3a) for one pair of matching socks the least number of selections you need to make is 2. For one pair of matching socks of each color you have to make at least six selections (assuming you pick the right sock each time) 3 pairs of socks is six socks.

4a) Yes

4b) yes

5a) The least number of selections you must make to get one pair of matching socks; you only need two socks so lets assume you pick the same color on the first two selections. The least number of selections you need to make for one pair of matching socks for each color is six. There are three colors of socks, to make a pair of each you need 2 of each color for a total of six socks. Again we assume you pick the correct sock with each selection.

***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 finger 3, ring finger 4, and little finger 5. Then se 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?*

1. *What if the girl counts from 1 to 10*
2. *What if the girl counts from 1 to 100*
3. *What if the girls counts from 1 to 1000*

1a) A girls is counting on her fingers starting with her thumb at 1 to her pinky at 5 then reverses her direction but continues counting up until she reaches her thumb again at 9 then continues counting up on her fingers in the original manner with her pinky being 13 the second time.

1b) I am not sure on this one.

2a) there are 5 fingers on one hand, the order reverses and the index rises simultaneously.

2b) What finger does the girl land on on the number 10? The number 100? Or the number 1000?

3a) Count on my hand to 10, 100, and 1000

4a) yes

4b) yes (although a mathematical function would be much faster and practical this problem has me stumped.

5a) The number 10 is the index finger, the number 100 is on the ring finger, the number 1000 is on the index finger. An even number of 100’s (i.e. 200, 400, 600, etc…) lands on the index finger. An odd number of 100’s (i.e. 100, 300, 500, etc…) lands on the ring finger.