For each of the problems be sure to identify each of the steps discussed in the problem-solving lesson.

1. Define the problem
   1. Do this in *your own words*.
   2. What insight can you offer into the problem that is not immediately visible from the word problem alone?
   3. What is the overall goal?
2. Break them apart
   1. What are the constraints?
   2. What are the sub-goals?
3. Identify potential solutions
   1. For each of the sub-problems you’ve discussed in #2, what is a possible solution?
4. Evaluate potential Solution
   1. Does each solution meet the goals?
   2. Will each solution work for ALL cases?
5. Choose a solution and develop a plan to implement it
   1. Explain the solution in full.
   2. 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 communication 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 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
   1. The problem here is the man has a boat that will only fit him and 1 item/animal. If he leaves the parrot and the cat to bring the seed first the cat will eat the parrot. If he leaves the parrot and the seed to bring the cat over first the parrot will eat the seed.
   2. An insight that is not immediately visible in the problem is if he brings the parrot first and then goes back to get either the cat or the seed, he will have the same problem when he leaves the drop off side to go back and get the last item/animal.
   3. The overall goal is to get the get the parrot, the cat and the seed over to the other side without the parrot eating the seed or the cat eating the parrot.
2. Break them apart
   1. The constraints are that if you leave the parrot alone with the bag of seed, the parrot will eat the seed. If you leave the cat alone with the parrot, the cat will possibly eat the parrot.
   2. Sub-goals?
      1. Get the parrot on the other side without being eaten on either side
      2. Get the bag of seed on the other side without being eaten on either side
      3. Get the cat on the other side without eating the parrot on either side
3. Identify potential solutions
   1. Solutions to sub-goals
      1. Bring parrot over first
      2. Bring the bag of seed over second and bring the parrot back to the other side
      3. Bring cat over and then go back and get the parrot.
4. Evaluate potential Solution
   1. Each solution meets the goals.
   2. Each solution works for all cases.
5. Choose a solution and develop a plan to implement it
   1. The man can bring the parrot over first and then go back to get the bag of seed. The man then can drop the bag of seed off and bring the parrot back over to the first side. Then he will drop the parrot off on the first side and bring the cat over to the other side. Lastly he will go back and get the parrot and all 4 of them will be on the 2nd side.
   2. I strategized in my head about how I can solve this problem. At first, I thought the man could put the parrot on his shoulder and bring the bag of seed over in the boat, drop the seed off and when the parrot still on his shoulder he could then bring the cat. Thinking while watching the bag of seed the parrot wont eat it and by watching the cat, the cat won’t eat the parrot. Then I realized that we do not know how big these animals are and how big the bag of seed it. The parrot could be too large to fit on the man’s shoulder. I knew I was close to solving. That is when I thought what if the man could bring the parrot over first. The he could go back and get the bag of seed. When he drops off the seed he brings the parrot back with him. I continued throughout the problem and finally I realized I was finished. The problem was solved.

Socks in the Dark:

1. 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:
2. At least one matching pair.

i. 4

1. At least one matching pair of each color.

i. 10

1. Define the problem
   1. The problem is that you have 20 total pairs of socks. 5 pairs are black, 3 pairs are brown and 2 pairs are white. You need to select the smallest number of socks in the dark to get at least 1 matching pair and at least 1 matching pair of each color.
   2. Some insight is that there are 10 total socks that are black, 6 total socks that are brown and there are 4 total socks that are white.
   3. The goal is that you need you choose the smallest number of socks to get at least 1 matching pair and at least 1 matching pair of each color.
2. Break them apart
   1. The biggest constraint is that you are selecting these socks in the dark
   2. Sub Goals
      1. Selecting the smallest amount of socks to get at least 1 matching pair.
      2. Selecting the smallest amount of socks to get at least 1 matching pair of each color.
3. Identify potential solutions
   1. For each of the sub-problems you’ve discussed in #2, what is a possible solution?
4. Evaluate potential Solution
   1. Does each solution meet the goals?
   2. Will each solution work for ALL cases?
5. Choose a solution and develop a plan to implement it
   1. Explain the solution in full.
   2. 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 communication the solution).

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?

1. What if the girl counts from 1 to 10
   * 1. First finger
2. What if the girl counts from 1 to 100
   * 1. Ring finger
3. What if the girl counts from 1 to 1000
   * 1. First Finger
4. Define the problem.
   1. Do this in *your own words*.
   2. What insight can you offer into the problem that is not immediately visible from the word problem alone?
   3. What is the overall goal?
5. Break them apart
   1. What are the constraints?
   2. What are the sub-goals?
6. Identify potential solutions
   1. For each of the sub-problems you’ve discussed in #2, what is a possible solution?
7. Evaluate potential Solution
   1. Does each solution meet the goals?
   2. Will each solution work for ALL cases?
8. Choose a solution and develop a plan to implement it
   1. Explain the solution in full.
   2. 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 communication the solution).