



Activity: Problem Solving

OVERVIEW:

Exercise your problem-solving skills with this collection of puzzles and word problems that are analogous to some of the problems you will have to understand and solve in programming.

OBJECTIVES:

Successful completion of this activity will show that you can:

- Define the goals and parameters of a problem.
- Break down complex problems into parts for a solution.
- Identify and apply methods for problem solving.
- Explain how you arrived at a solution.

CRITERIA:

For each solution you will need the following:

- Create a solution for each of the problems below.
- You will need to commit this file to your Git repository. A minimum of 20 meaningful commits are required, **or this assignment will receive an automatic 0.**

GETTING STARTED:

- Create a word processing document and place your name, date, class and assignment name in the document's header.
- Place that file in your Git repository within a folder named **ProblemSolving**.

TURNING IT IN:

- Archive your document as a zip file.
- Name that .zip file with the following:
 - `lastName_firstName_ProblemSolving.zip`
- Submit it to the repo and FSO as directed by your instructor.

PROBLEMS:

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

1) Define the problem

- a) Do this in *your own words*.
- b) What insight can you offer into the problem that is not immediately visible from the word problem alone?
- c) What is the overall goal?

2) Break the problem apart

- a) What are the constraints?
- b) What are the sub-goals?

3) Identify potential solutions

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

4) Evaluate each potential solution

- a) Does each solution meet the goals?
- b) Will each solution work for ALL cases?

5) 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).

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.

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*.

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 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