CIT 103: Workshop Lab Assignment #3

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1 Introduction to the Problem Solving Process

The Problem Solving process consists of a sequence of sections that fit together depending on the type of problem to be solved. These are:

- Problem Definition.
- Problem Analysis.
- Generating possible Solutions.
- Analyzing the Solutions.
- Selecting the best Solution(s).
- Planning the next course of action (Next Steps)

The process is only a guide for problem solving. It is useful to have a structure to follow to make sure that nothing is overlooked. Nothing here is likely to be brand new to anyone, but it is the pure acknowledgement and reminding of the process that can help the problems to be solved.

Problem Definition

The normal process for solving a problem will initially involve defining the problem you want to solve. You need to decide what you want achieve and write it down. Often people keep the problem in their head as a vague idea and can so often get lost in what they are trying to solve that no solution seems to fit. Merely writing down the problem forces you to think about what you are actually trying to solve and how much you want to achieve. The first part of the process not only involves writing down the problem to solve, but also checking that you are answering the right problem. It is a check-step to ensure that you do not answer a side issue or only solve the part of the problem that is most easy to solve. People often use the most immediate solution to the first problem definition that they find without spending time checking the problem is the right one to answer.

Problem Analysis

The next step in the process is often to check where we are, what is the current situation and what is involved in making it a problem. For example, what are the benefits of the current product/service/process? And why did we decide to make it like that? Understanding where the problem is coming from, how it fits in with current developments and what the current environment is, is crucial when working out whether a solution will actually work or not. Similarly you must have a set of criteria by which to evaluate any new solutions or you will not know whether the idea is workable or not. This section of the problem solving process ensures that time is spent in stepping back and assessing the current situation and what actually needs to be changed.

After this investigation, it is often good to go back one step to reconfirm that your problem definition is still valid. Frequently after the investigation people discover that the problem they really want to answer is very different from their original interpretation of it.

2 Lab Objective

To analyse the problem by defining the problem.

- Write introduction to the problem at hand.
- Give a brief about the theory/concepts related to the problem.

3 Questions

Question 1

Determine how many zeros end in the number 100!.

Info: Flowchart/Algorithm not required

Recall: 100! = 100 x 99 x 98 x . . . x 1 Adding a zero the end of a product occurs precisely when we multiply by 10. The multiplication of odd numbers except the multiples of 5 don't contribute to the zeros in the product. In fact in a range from 1 to 9, a single even number is sufficient to bring a zero to the product as only 5 can produce a product that ends in 1 zero. 10 will also contribute, but then it is also a multiple of 5. The solution can be thought by counting the number of multiples of 5 between 1 and 100. But then other 5 are present also. For example the multiple of 25 has two 5s in them. There are altogether four multiples of 25 in the range of 1 to 100. So, in altogether:

- There are 20 multiples of 5.
- And 4 multiples of 25.

Question 2

A seminar has been conducted in a group of 48 students. On entering the seminar, everyone shakes hand with every participant exactly once, how many handshakes are possible?

Info: Flowchart/Algorithm not required

Ask Yourself: How many handshakes would the last student do on entering the classroom? And what would be the case for second-last student?

Question 3

Suppose now that there are k students in the class. If k is even, then will the number of handshakes will be even or odd? If k is odd then will the number of handshakes that takes place be even or odd? Write a flowchart and algorithm to find if the number is odd or even.

Question 4

We are given k objects $\{a_1, a_2, \ldots, a_k\}$. How many different ordered pairs may be made up from those k objects?

Info: Flowchart/Algorithm not required
Remember Ordered Pair (x,y)!

Question 5

Suppose that S is a set with k elements. Show that S has precisely 2^k subsets.

Info: Flowchart/Algorithm not required
Use the induction principle.

Question 6

Liar and Truth Problem:

Suppose you are in Mars with different people from Earth. They have been cursed. They can be either truth tellers or liars. When asked a Yes-No question, truth teller always tells the truth and the liar tells a lie. You are in urgent need to return Earth as you discover the fact about the population. What question would you ask them to find the direction where spaceship has been?

Info: Flowchart/Algorithm not required
Problems of Logic