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## Reading Material

**1.1 Introduction to Problem Solving**

A computer, as fast and powerful as it is, is still not capable of solving a problem by itself. It needs to be told exactly what problem to solve and how to solve it. This places the responsibility on the programmer to instruct the computer precisely so that the machine can perform the expected job correctly.

To write a program to solve a problem, it is critical that the user (or programmer) must first have a clear understanding of the problem to be solved. Once that is done, the various solutions should be considered and evaluated. The optimal solution must then be translated into a method in the form of a series of well-defined and sequential steps.

It is important to know which solution to use and when, especially considering code performance, memory access and movement, data storage, improvement and scalability costs, and finally, the quality of the output. What is the use of writing an algorithm that takes two days to perform a task such as *"predicting tomorrow's weather condition based on today's weather report"*?

Problem solving requires the user to go through a set of stages to arrive at the best solution. They are:

- **Understand and define the problem:** Try to understand the problem from multiple angles
- **Gather data and identify required results:** From the understanding derived from the first phase, gather all the inputs that are necessary and most importantly be clear about the desired results
- **Analyse the problem:** After understanding the problem and the expected results thoroughly, look for different ways of solving the problem and evaluate each of these methods. The result of this stage is an overview of the solution in terms of the sequence of steps that need to be carried out
- **Reach an appropriate solution using problem solving techniques:** This is the final stage and involves converting the solution overview from the previous stage into a detailed step-by-step solution. This is then converted into a set of instructions that the computer can understand and execute. This stage is also broadly referred to as *programming*. While solving a problem we need to ensure that the solution is **correct, efficient and optimal**, and **scalable**.

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