Problem Analysis

Algorithm

Definition: An **algorithm** is a solution that solves a problem through a set of clearly defined steps. It involves the development of a set of instructions or rules.

Inputs and Outputs

Inputs

Definition: An input is any detail that can affect what we require for the output.

Specifying Inputs

Good input specifications must:

- 1. Include only the important data that can affect what we require for the output and exclude any irrelevant details.
- 2. State the range of valid or acceptable values for these inputs.

Example

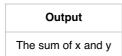
Input
x: a positive whole number
y: a positive whole number

Outputs

Definition: An output is the result that the algorithm produces.

Specifying Outputs

Example



Problem-Solving Techniques

Decomposition

Decomposition is a technique of breaking down a complex problem or process into smaller parts (sub-problems) such that each part is more manageable and easier to understand.

Two Approaches to Decomposition

1. Incremental approach:

 Identify quantitative features of the input or output that are causing the problem to be too large to handle. Sometimes, the solution to a small version of the problem with one or more features reduced can be found and gradually extended to larger versions of the problem. Each gradual extension of the solution is a separate subproblem.

2. Modular approach:

 Solve simple examples of the problem manually and identify tasks that are of different natures. Usually, these tasks can be separated from each other to become distinct sub-problems. This usually results in sub-problems that are different from each other.

Generalisation

Generalisation is a technique of replacing two or more similar items with a single, more general item.

Pattern Recognition

Pattern recognition is the technique of identifying similarities among two or more items.