

ICT Programming Lesson 2: Thinking Logically



Objectives

- 4.2.1: The strategies used in problem solving, and how they relate to computer programming.
- 4.2.2: An "algorithm," is a set of rules or instructions for performing a task or problem solving.
- 4.2.3: There are three types of programming errors (i.e., logic, syntax, runtime). There are different forms of testing that can be used to locate and debug errors.
- 4.2.4: Solve a problem using logic by planning a strategy, designing and testing a hypothesis, and/or creating a set of step-by-step instructions to perform a task.

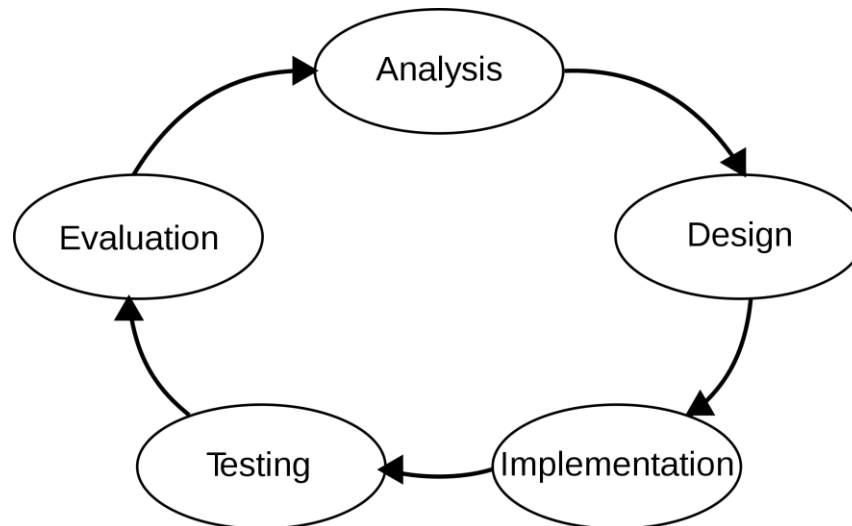
Programming Skills

- **Problem solving:** the orderly use of procedures for finding solutions to problems.
- **Logical thinking** is progressively moving from one connected thought to another
- Problem-solving and logical-thinking skills are critical to computer programmers.



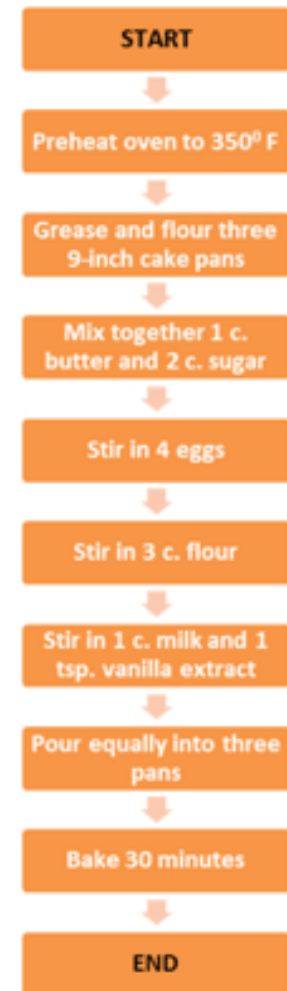
Problem Solving Steps

- Step 1. Understand the problem.
- Step 2. Devise a plan.
- Step 3: Implement the plan
- Step 4. Test the plan
- Step 5. Review the result.
- If revision is necessary, return to Step 1 until the correct solution is found.



Algorithm

- A set of step by step instructions that must be executed to achieve a solution or perform a task
- Tell the computer what to do and how to do it
- Should be clear and efficient



Algorithm

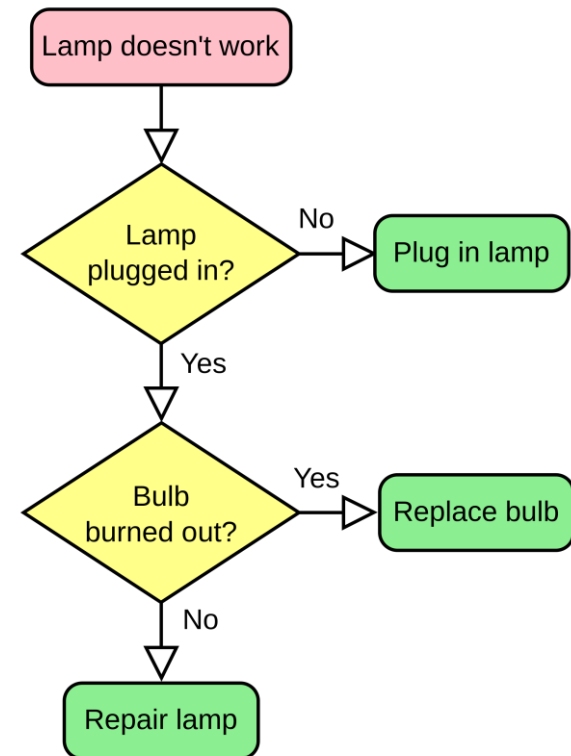
Susan has 15 apples. Lisa has 10 apples. Susan gives Lisa 2 apples. Susan now has how many more apples than Lisa has?

A possible algorithm to solve this problem is as follows:

1. Susan's apples: 15
2. Subtract 2 apples from Susan's total apples: $15 - 2 = 13$
3. Lisa's apples: 10
4. Add 2 apples to Lisa's total apples: $10 + 2 = 12$
5. Subtract Lisa's total apples from Susan's total apples: $13 - 12 = 1$
6. Solution: Susan has 1 more apple than Lisa has.

Pseudocode - Flowcharts

- **Pseudocode** is a way of writing the details of algorithm steps in English using short phrases to describe the project outline
- Example: *Set FLSalesTax = 0.06 or Output Results*
- **Flowchart**: graphical diagrams that are used to show the steps, or flow, contained in an algorithm.
- Flow charts contain different symbols to represent the purpose or process of particular steps.



Pseudocode - Flowcharts

- Flowcharts and pseudocode provide the programmer with a way of outlining a program algorithm
- Allow the programmer to focus on the logic of the algorithm and make refinements before translating it into statements in a particular programming language.

Testing & Debugging

- **Debugging:** identify errors and make necessary corrections to meet the program's intended outcome
- **Desk checking:** the process of using a pencil and paper to work through the program by hand



Programming Errors

- **Logic error** causes the program to produce incorrect or unexpected results, and may be caused by an incorrect sequence of instructions or formula used in a calculation. Logic errors can be difficult to identify because they do not stop the program or produce an error message.
- **Syntax error** is usually found by the compiler or interpreter when it does not understand or recognize code given, such as a typo, misspelling or missing code.
- **Runtime error** occurs while the program is running. It generally means a piece of code cannot be loaded or contains an error that caused the program to stop.