How to Write and Execute a Program?

Problem

- Sub problems (Divide and conquer the problem into sub problems)

![Diagram showing the process of writing and executing a program]

1. Source Program
2. Compiler (Translator)
3. object
4. Linker and loader
5. Memory
6. Executable Program

- Library file in machine language
- Bytecode (equivalent of object code)
- Java Translator (compiler)
- Java Program
Robo:

- \( F(x) \): move \( x \) units forward
- \( R(x) \): turn \( x \) degrees to the right
- \( L(x) \): turn \( x \) degrees to the right
- \( P \): pen up and pen down

\[
\begin{array}{c}
\text{r(30)} \\
\text{f(200)} \\
\text{r(120)} \\
\text{f(200)} \\
\text{r(120)} \\
\text{f(200)}
\end{array}
\]

PROBLEM SOLVING & PROGRAMMING

- The purpose of writing a program is to solve a problem. Problem solving consists of multiple steps:

  1. Understand the problem.
  2. Dissect the problem into manageable pieces.
  3. Design a solution.
  4. Consider alternatives to the solution and refine it.
  5. Implement the solution.
  6. Test the solution and fix any problems that exist.
Key Idea: Divide & Conquer!!

Problems

Sub Problems

- **ALGORITHM:** It is the step by step definition of the solution of a problem. In other words, we can say that it is the step-by-step process for solving a problem. For you to understand it clearly some examples for algorithms are stated below:
  - A recipe,
  - Travel directions,
  - Operating a machine, etc.

!!!REMARK: Every program implements an algorithm. So every software developer should spend time thinking about the algorithm before writing any code.

An algorithm must:
- Have more than one input,
- Have at least one output,
- Be clear, have unambiguous steps,
- Stop, come to an end,
- Be correct!!

- An algorithm can either be described by a flowchart or by using pseudo code.
FLOWCHART SYMBOLS:

- Oval: start/end
- Rectangle: computation/assignment
- Diamond: decision making
- Parallelogram: input
- Trapezoid: output

Example: Find the maximum of x and y, assign it to A.

ALGORITHM

START

READ X, Y

X>Y

A=Y

A=X

DISPLAY A

STOP
Black Box: *We know what it does for us but we do not know how.*

- **PSEUDO CODE**: It is a mixture of code statements and English phrases, writing the solution in natural language.

  // Find the maximum of x, y and assign it to A

  read x,y

  if x>y then
    A=x
  else
    A=y
  (end if)

  display A

  stop
Example: Find maximum of X, Y, Z and assign it to A

Trace: X/1 Y/5 Z/10   A/10