# CHAPTER 2

# PROBLEM SOLVING

By: Atiya Jokhio

- This chapter will cover the following topics:
  - Problem Solving Concepts for the Computer
  - Pre-Programming Phase
  - Programming Or Implementation Phase

# What Problem Can Be Solved By Computer

- When the solution can be produced by a set of step-by-step procedures or actions.
- This step-by-step action is called an *algorithm*.
- The algorithm will process some inputs and produced output.
- Solving problem by computer undergo two phases:
- Phase 1:
    - Organizing the problem or pre-programming phase.
- Phase 2:
    - Programming phase.

# PRE-PROGRAMMING PHASE

- This phase requires five steps:
  - Analyzing the problem.
  - Developing the Hierarchy Input Process Output (HIPO) chart or Interactivity Chart (IC).
  - Developing the Input-Process-Output (IPO) Chart.
  - Drawing the Program flowcharts.
  - Writing the algorithms.

# PRE-PROGRAMMING PHASE

- **Analyzing The Problem**
  - Understand and analyze the problem to determine whether it can be solved by a computer.
  - Analyze the requirements of the problem.
  - Identify the following:
    - Data requirement.
    - Processing requirement or procedures that will be needed to solve the problem.
    - The output.

# PRE-PROGRAMMING PHASE

- All These requirements can be presented in a Problem Analysis Chart (PAC)

| Data | Processing | Output |
| --- | --- | --- |
| given in the problem or provided by the user | List of processing required or procedures. | Output requirement. |

# PRE-PROGRAMMING PHASE

- Example: **Payroll Problem**
- Calculate the salary of an employee who works by hourly basis. The formula to be used is
- Salary = Hour works * Pay rate

| Data | Processing | Output |
|---|---|---|
| Hours work,<br>Pay rate | Salary = Hours work * payrate | Salary |

# Problem 1

Write a Problem Analysis Chart (PAC) to convert the distance in miles to kilometers where 1.609 kilometers per mile.

| Data | Processing | Output |
|---|---|---|
| Distance in miles | Kilometers = 1.609 x miles | Distance in kilometers |

# Problem 2

Write a Problem Analysis Chart (PAC) to find an area of a circle

where area = pi * radius * radius

| Data | Processing | Output |
|---|---|---|
| radius | area = 3.14 x radius x radius | area |

# Problem 3

Write a Problem Analysis Chart (PAC) to compute and display the temperature inside the earth in Celsius and Fahrenheit. The relevant formulae are

Celsius = 10 x (depth) + 20

Fahrenheit = 1.8 x (Celsius) + 32

| Data | Processing | Output |
|---|---|---|
| depth | celsius = 10 x (depth) + 20<br>fahrenheit = 1.8 x (celsius) + 32 | Display celsius,<br>Display fahrenheit |

# Problem 4

Write a problem analysis chart (PAC) that asks a user to enter the distance of a trip in miles, the miles per gallon estimate for the user's car, and the average cost of a gallon of gas. Calculate and display the number of gallons of gas needed and the estimated cost of the trip.

# PRE-PROGRAMMING PHASE

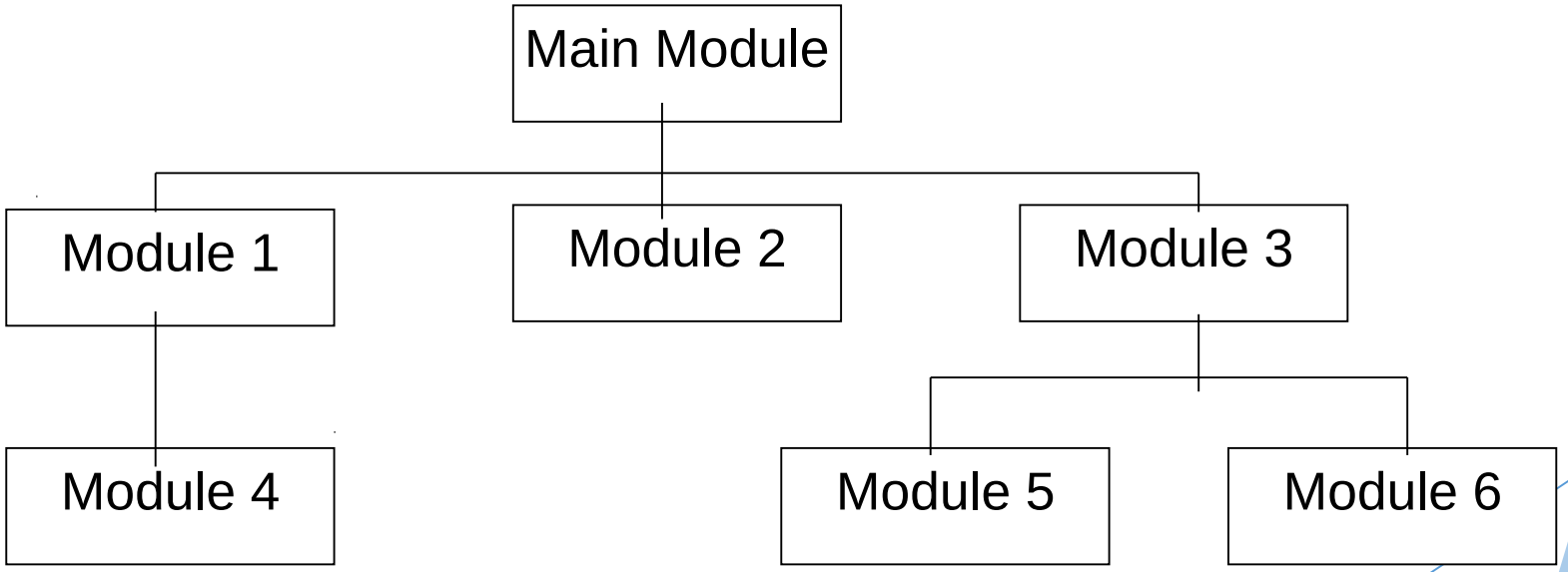
- **Developing the Hierarchy Input Process Output (HIPO) or Interactivity Chart**
  - The problem is normally big and complex.
  - Thus, requires big program.
  - Thus, the processing can be divided into subtasks called modules.
  - Each module accomplishes one function.
  - These modules are connected to each other to show the interaction of processing between the modules.

# PRE-PROGRAMMING PHASE

- Main/control module controls the flow all other modules.
- The IC is developed using top-down-method: top to down left to right order (also refer to order of processing).
- Modules are numbered, marked for duplication, repetition or decision.

# PRE-PROGRAMMING PHASE

- The interaction will form a hierarchy, called Hierarchy Input Process Output Chart (HIPO) or Interactivity Chart (IC). Programming which use this approach (problem is divided into subtasks) is called *Structured Programming*.



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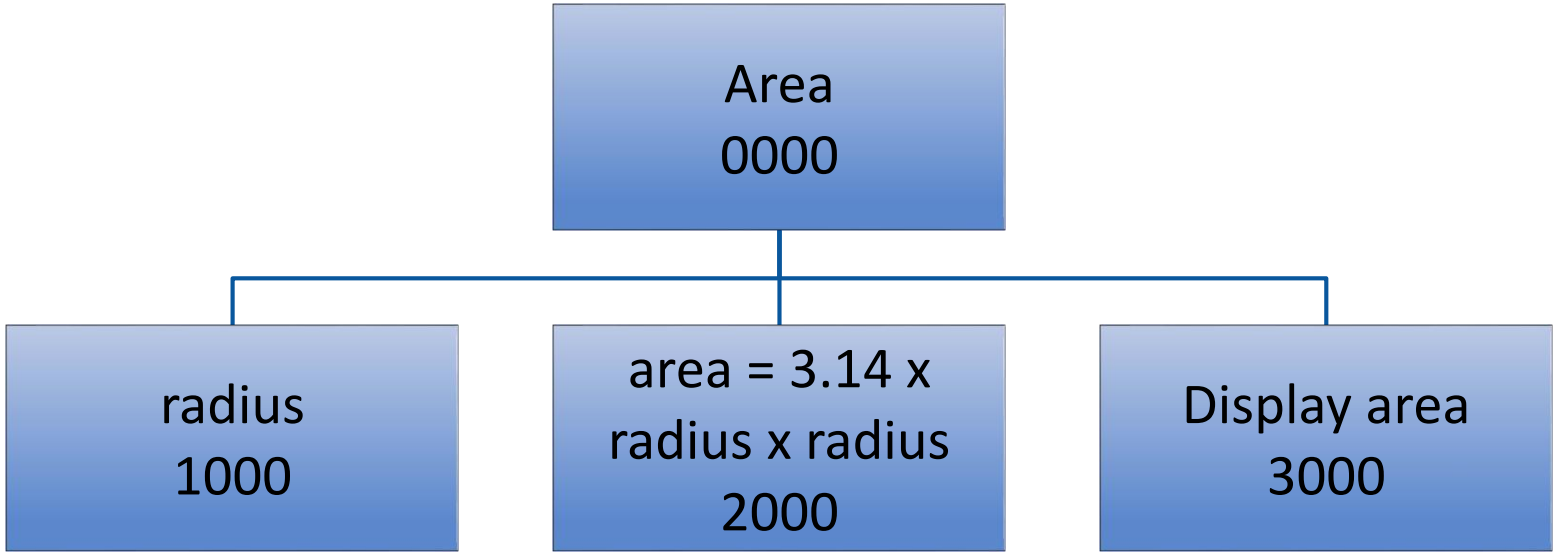

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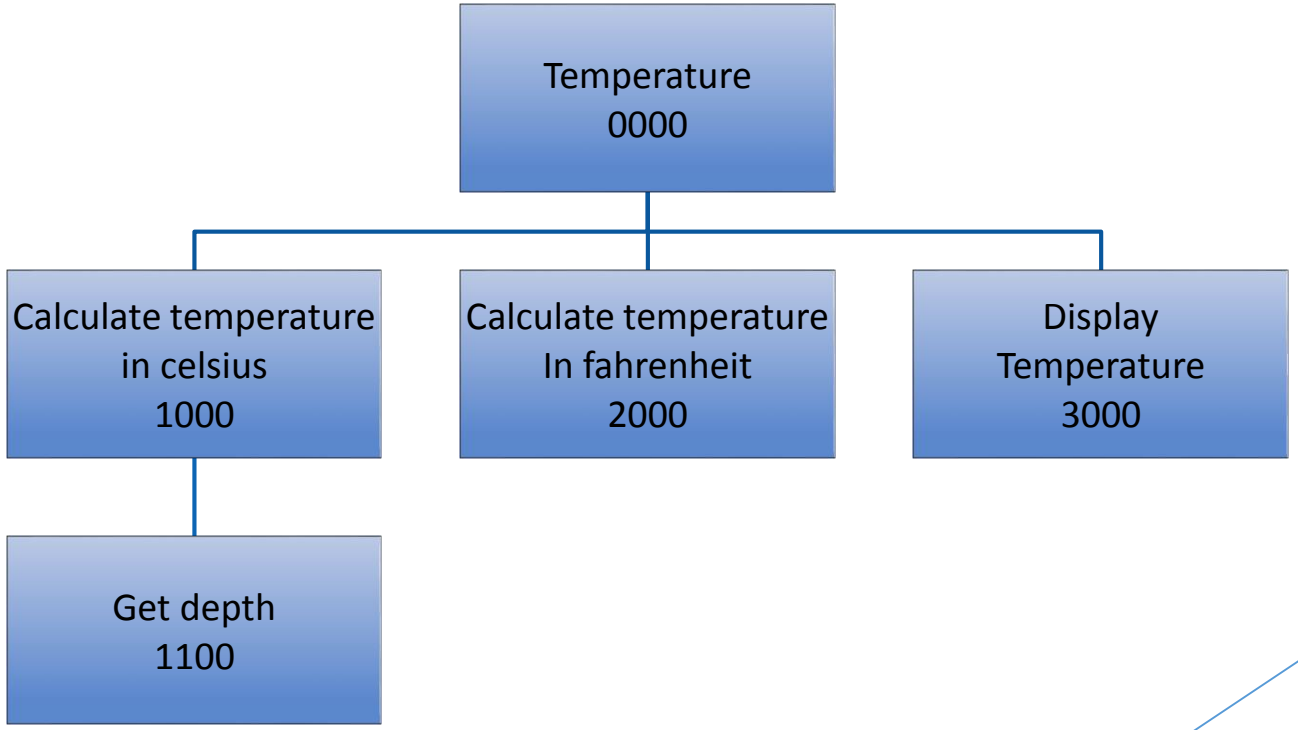
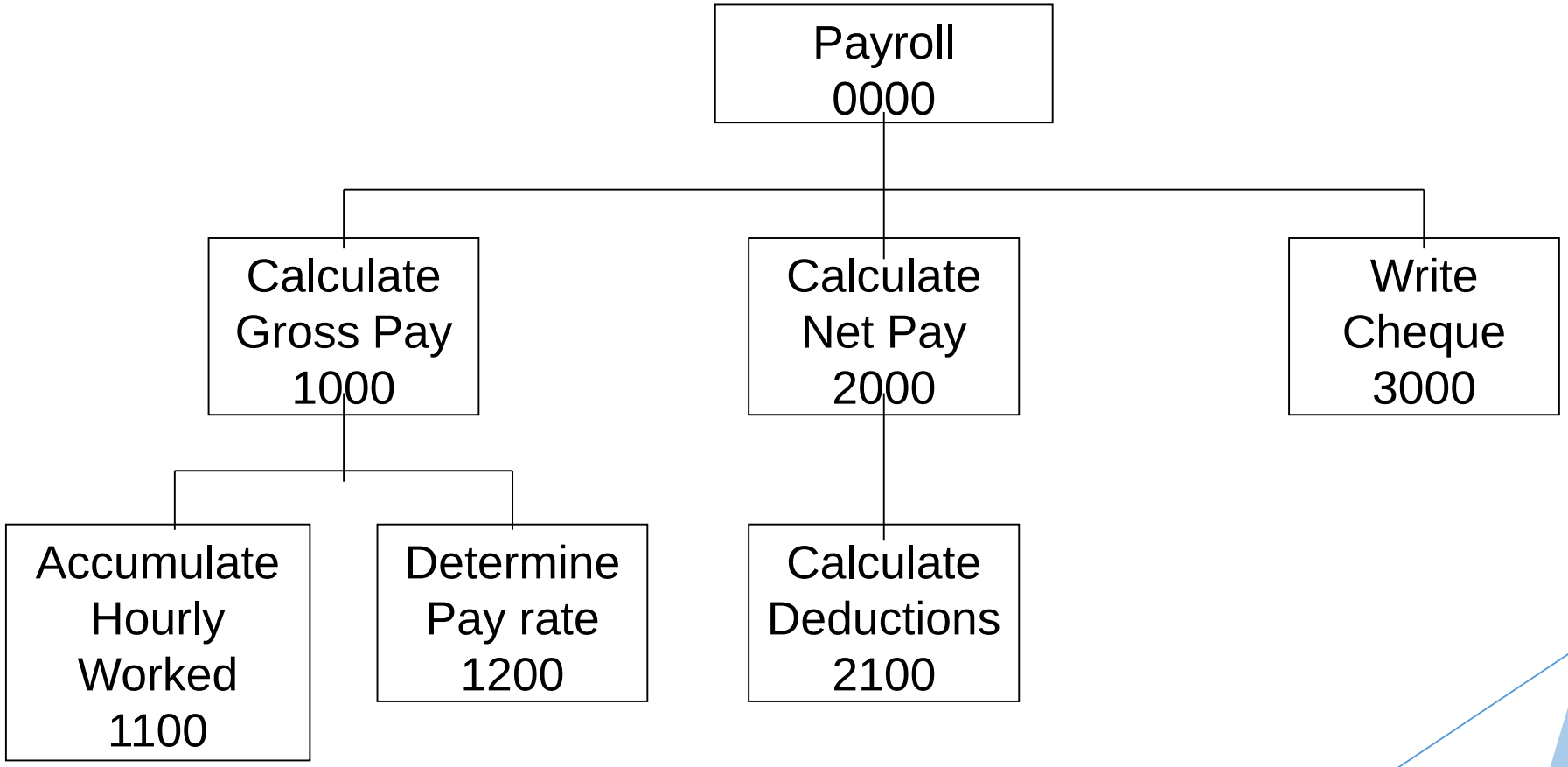


# PRE-PROGRAMMING PHASE

**Example 2.2: Extended Payroll Problem**

You are required to write a program to calculate both the gross pay and the net pay of every employee of your company. To determine the gross pay, you have to multiply the accumulated total hours worked by the employee, by the appropriate pay rate. The program should print the cheque that tells the total net pay. The net pay is calculated by subtracting the gross pay with any deductions that may be incurred by the employee.

# PRE-PROGRAMMING PHASE



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