CHAPTER 7

Problem Solving

Information Technology for CSEC, 2nd Edition, Leo Cato…

(Pages 49 – 55)

Welcome To Programming

- What Is Programming?
- Is Computer Programming Hard To Learn?

PROBLEM DEFINED
(Page 49)

Problem:

- Is a matter or situation that could be better, that can be improved on, or that requires a solution.

To Solve A Problem:

- Create a step-by-step list of how you are going to solve the problem so that your solution is accurate.

COMPUTER PROGRAM

- A **computer program** is a set of precise instructions written in programming language, which are used for solving a problem, perform a calculation, and control an operation.

What Is An Algorithm?

An **algorithm** is a set of instructions in a logical sequence to solve a given problem.

Four important attributes:

1. They must be precise
2. They must be unambiguous
3. They must be finite, that is, terminate after a finite number of steps.
4. The instructions must be in a logical sequence.

TWO PHASES TO SOLVE A PROBLEM (Page 49)

1. **Problem Solving Phase** – it is phase of planning and documentation. During this phase there is NO hands-on programming on the computer.
2. **Implementation Phase** – This is implementing the design done in problem-solving phase and includes hands-on programming design on the computer.

SIX STEPS TO SOLVE A PROBLEM (Page 49)

PROBLEM SOLVING PHASE

1. Identify & Define The Problem
2. Analyze The Problem & Break It Into Components
3. Develop An Algorithm
4. Test The Algorithm To See If It Works

IMPLEMENTATION PHASE

1. Write A Program In Programming Language
2. Test & Debug The Program

STEP 1: IDENTIFY & DEFINE THE PROBLEM (Page 50)

- Help To Ensure That There Is **NO** Uncertainty or Ambiguity.

- Example:

Calculate The Price

vs.

Add the prices of 3 items to get a total price.

STEP 2: ANALYZE THE PROBLEM (Page 50)

- Help To Take A Complex Program And Break It Into Easily Manageable Components.

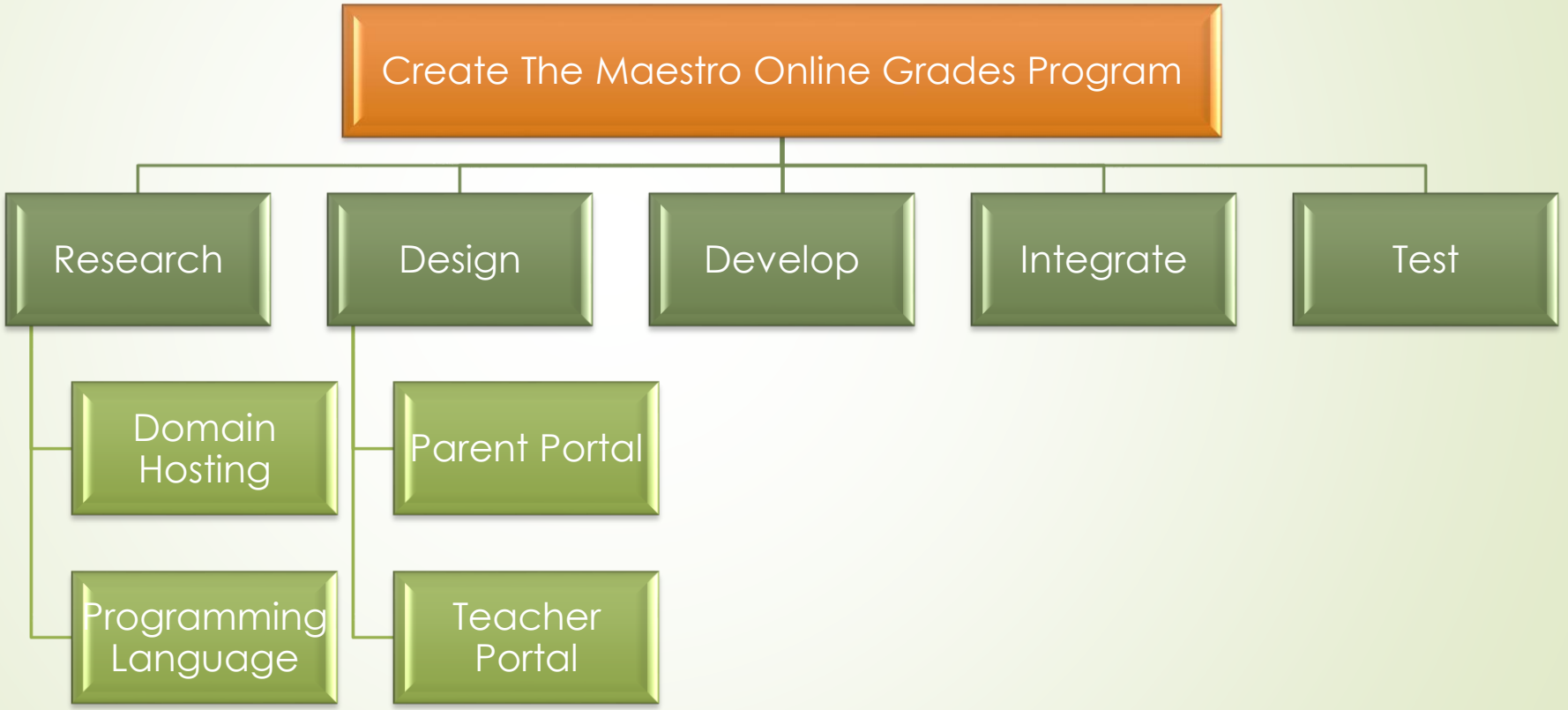
- **Top Down Design:** Breaks A Problem Into Smaller Problems or Sub-Problems. Then solve the smaller problems and combine the solutions to solve the original problem

TOP DOWN DESIGN EXAMPLE

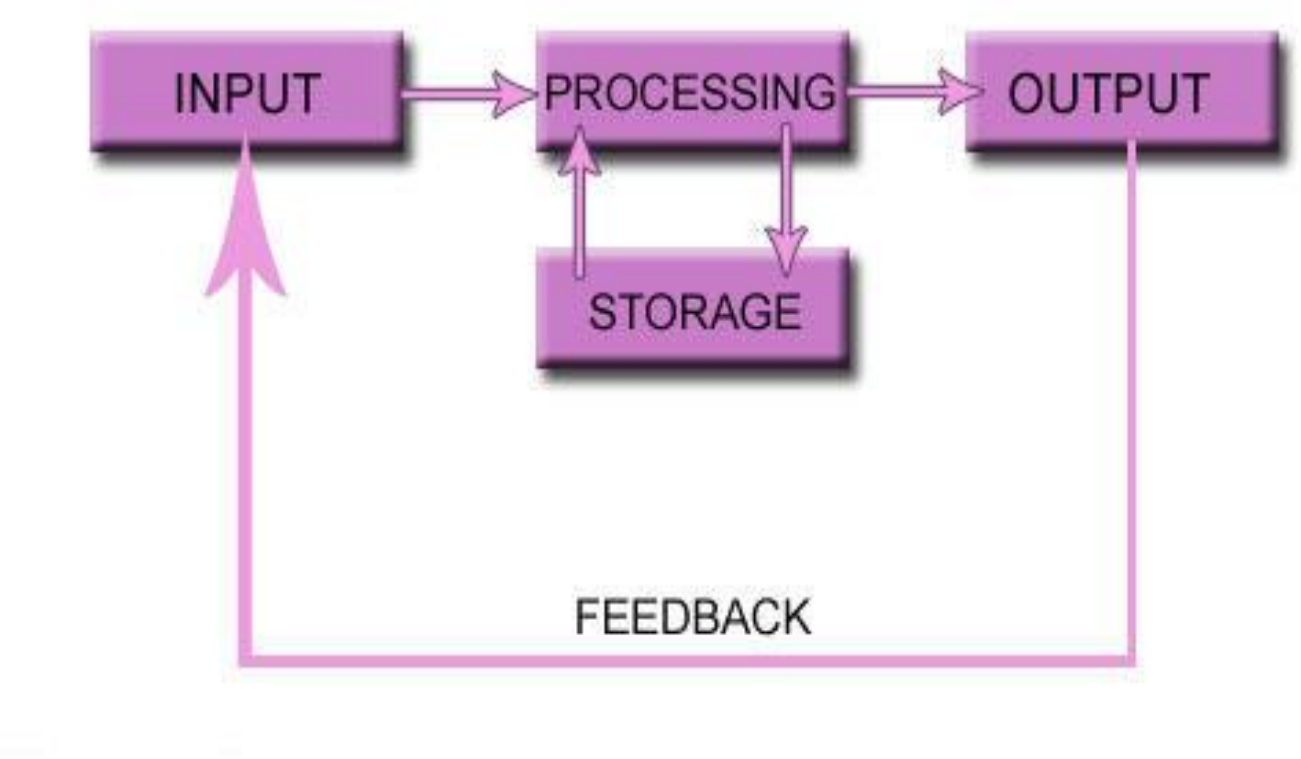
STEP 2: ANALYZE THE PROBLEM (Page 51)

- **Stepwise Refinement:** Breaks A Problem Into Smaller Problems or Sub-Problems and then those smaller problems are broken into even smaller problems.

STEPWISE REFINEMENT EXAMPLE



INPUT, PROCESSING & OUTPUT
(Page 52 – Diagram Page 1)



INPUT, PROCESSING & OUTPUT (Page 52)

- **INPUT**
- Input is data that you will need in order to calculate or solve a problem.
- Keywords: **ENTER, READ, INPUT,…**

INPUT, PROCESSING & OUTPUT (Page 52)

- **PROCESSING**
- Processing statements tell you what needs to be done to solve a problem.
- Keywords: **CALCULATE, FIND, COMPUTE, CONVERT, ADD, SUBTRACT, MULTIPLY, DIVIDE**

INPUT, PROCESSING & OUTPUT (Page 53)

- **OUTPUT**
- Output statement contains the solution (information) or end result that you require.
- Keywords: **DISPLAY, PRINT, SHOW,…**

IPO CHARTS
(Page 53)

- **IPO CHART or Defining Diagram:** is a table that groups the different instructions and statements according to the type of component.
- **RULES OF AN IPO CHART**

Note: In our ITLAB, we will create our IPO chart in Microsoft Word. (Practice this using the tables features

IPO CHARTS
(Page 53)

- **RULES OF AN IPO CHART**

Input	Processing	Output
•**What is the user going to enter** •**Drop the keyword** and then list the input statement(s).	1. List ALL statements in this column (IPO) 2. Use keywords in this column 3. Numbered List in a logical order 4. Never use the phrase *Display/Print the results.* (What is the results?)	•**What is the program going to deliver** •**Drop the keyword** and then list the output statement(s).

IPO CHARTS
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- All names used in math formulas need to follow these rules:
  1. Name cannot start with a number
  2. Name cannot have spaces
  3. Name cannot use characters except underscore
  4. Name cannot be more than 2 words long.

IPO CHARTS
(Example 1) – The IPO Chart

INPUT

- Add the weights of two people to show a total weight

PROCESSING

OUTPUT

Input	Processing	Output
Weight of two people SAY Weight1 Weight2	1. Enter the weights of two people 2. Add the weights Total = weight1 + weight2 3. Show the total weight	Total Weight SAY Total

IPO CHARTS
(Example 2) – The IPO Chart

PROCESSING INPUT

- . Calculate the average math grade of four students and display the results.

OUTPUT

Input	Processing	Output
4 students math grades SAY grade1 Grade2 Grade3 grade4	1. Enter 4 students math grade 2. Calculate the average Average = (grade1 + grade2 + grade3 + grade4)/4 3. Display the average math grade	Average math grade SAY Average

IPO CHARTS
(Example 3) – The IPO Chart

Read the ages of three people and find the average. Print the results

Input	Processing	Output
Age of three people SAY Age1 Age2 Age3	1. Read the ages of three people 2. Find the average Average = (Age1 + Age2 + Age3)/3 3. Print the average age	Average Age SAY average

IPO CHARTS (What Have You Learnt?)

Practice Questions: Do IPO Charts for the following:

1. Calculate and print the average mark achieved for a test taken by four students.
3. Calculate the average temperature in degrees Celsius for the week and convert it into degrees Fahrenheit. Display the result.
8. Show the result of adding six numbers together and dividing the answer by 2.