Problem Solving

PAC, IC, IPO

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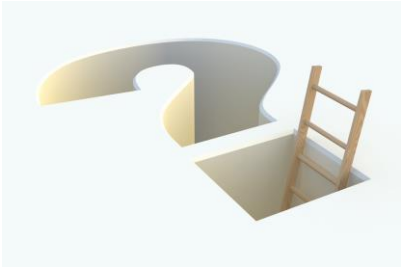
Chapter Description

- Aims
  - To analyze the problem using **Problem Analysis Chart** (PAC)
  - Set up the most efficient solution using **Interactivity Chart** (IC)
  - Use an IPO chart to designate the input, processing, module number and output for a solution of a problem
- Expected Outcomes
  - Use **a problem analysis chart** to consolidate data for the problem
  - Use an **interactivity chart** designates the modules to be used in the solution of a problem.
  - Use an **IPO chart** to designate the input, processing, module number and output for a solution of a problem.
- References
  - Sprankle, M., and Hubbard, J., (2012). Problem Solving and Programming Concepts : 9th Edition. Prentice Hall, 2012. ISBN : 0132492644

Problem???

Separate into three components



Input	Output	Processing
a list of data source provided to the problem	a list of the output required	a list of actions needed to produce the required outputs

What is PAC?

PAC (Problem Analysis Chart)

According to Sprankle and Hubbard, (2012), the initial step for a programs need to do when get a problem is to analyze and understand the requirements.

To easily analyze the problem, a Problem Analysis Chart (PAC) was introduced. This chart have four section:

- The given data
- The required result
- The processing involved
- A list of solution alternative

Problem Analysis Chart (PAC)

Table 1 show the four section and how PAC looks like.

Table 1: The four parts in PAC

Given Data	Required Result
Section 1 Data given in the problem / provided by the user	**Section 2** Requirements for the output reports including the information needed and the format required
Processing Required	**Solution Alternative**
Section 3 List of processing required including equations or other types of processing	**Section 4** List of ideas for the solution of the problem

Example 1: PAC

PROBLEM:

A program is required to find average of five numbers.

Given Data	Required Result
Number 1 **Number 2** **Number 3** **Number 4** **Number 5**	**Average of 5 numbers**
Processing Required	**Solution Alternative**
Total = Number 1 + Number 2 + Number 3 + Number 4 + Number 5 **Average = Total / 5**	**i. Define the numbers as constants.** **ii. *Define the numbers as input values**

Try This!!!

PROBLEM:

A program is required to find the volume of a cube. Please construct the PAC for this problem.

Given Data	Required Result
Processing Required	**Solution Alternative**

Interactivity Chart (IC)

Dividing the processing into subtask called

MODULE

Have main module and sub modules

Main module controls the flow of the sub modules

Connected to show interaction of process between modules

Each modules contain task to accomplish

Interactivity Chart (IC)

Two type of writing a solution

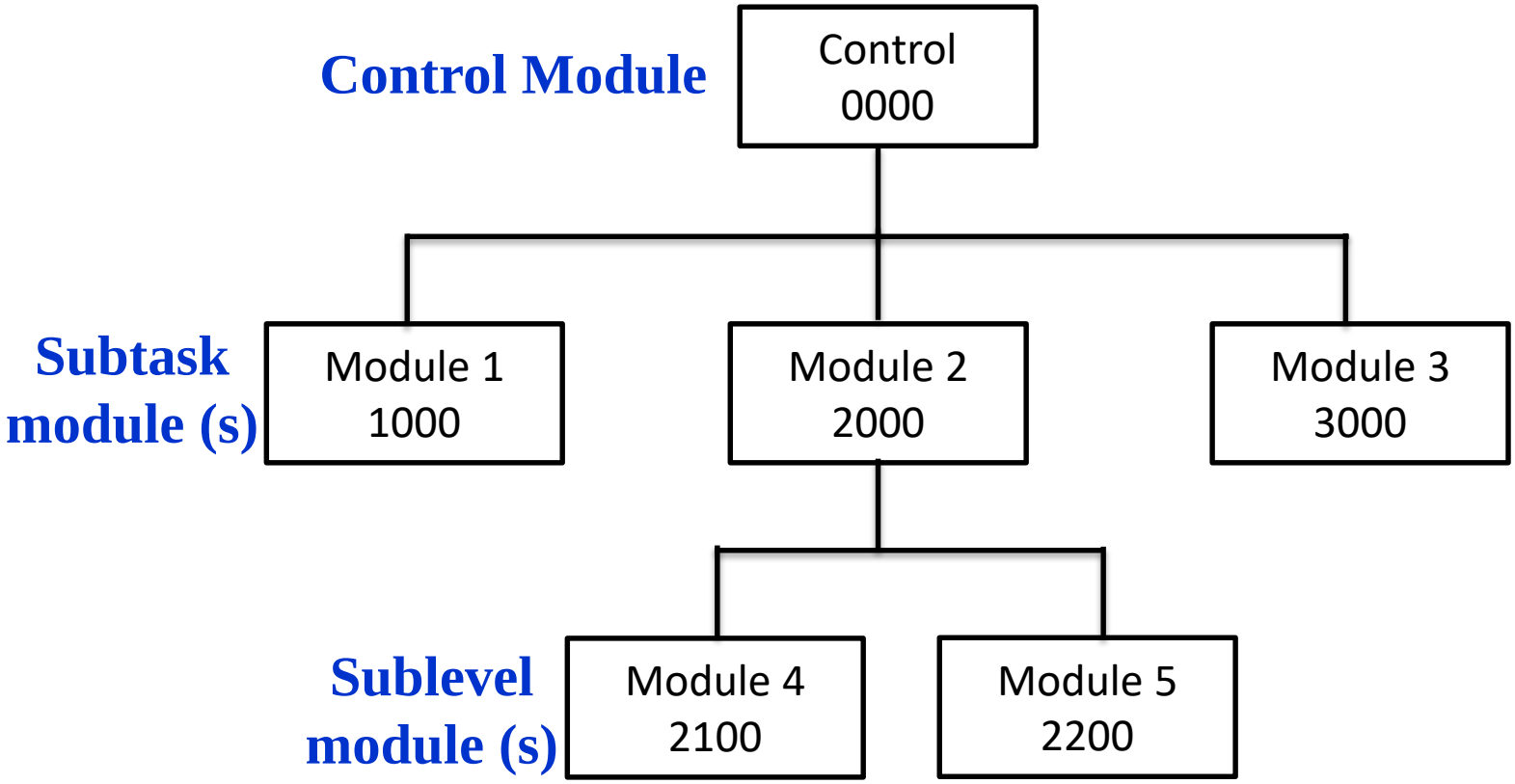
Procedural Programming

- Type of writing a solution
- Top-down method (processed from the top to the bottom)
- The module only process the tasks that connected to it

Object Oriented Programming

- *Event driven* - the user is in control
- User decides order of execution of the module
- each subtask modules are surround the control module

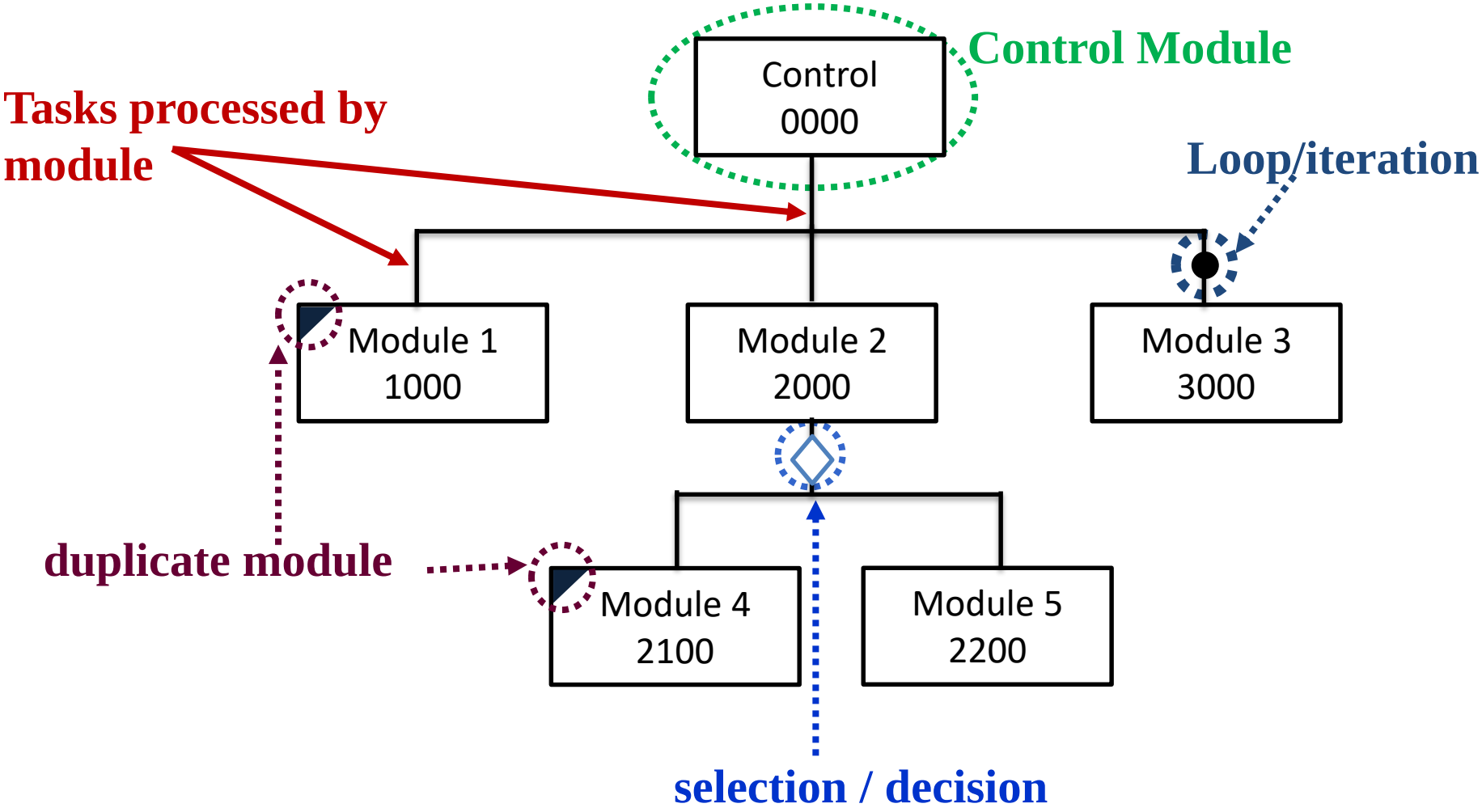
IC – Procedural Programming



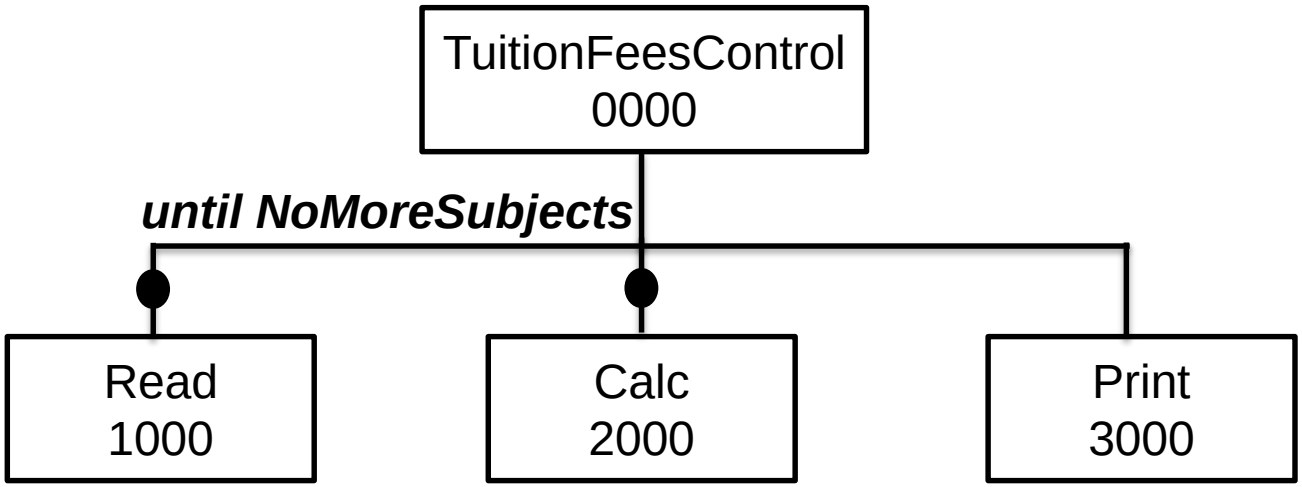
IC – Procedural Programming

Control Module On top Labeled (0000)	Controls the **processing of all the data**. The chart is display in top-down method and it means that as you divide the problem into subtasks, they demonstrate the order in which processes will occur from the top to the bottom of the chart.
Subtask Module(s)	The next level of rectangles starting with the number 1000, 2000, 3000 and increases **from left to right by increments of 1000**.
Sublevel Module(s)	The next level of rectangles starting with increments of 100 as in 1100

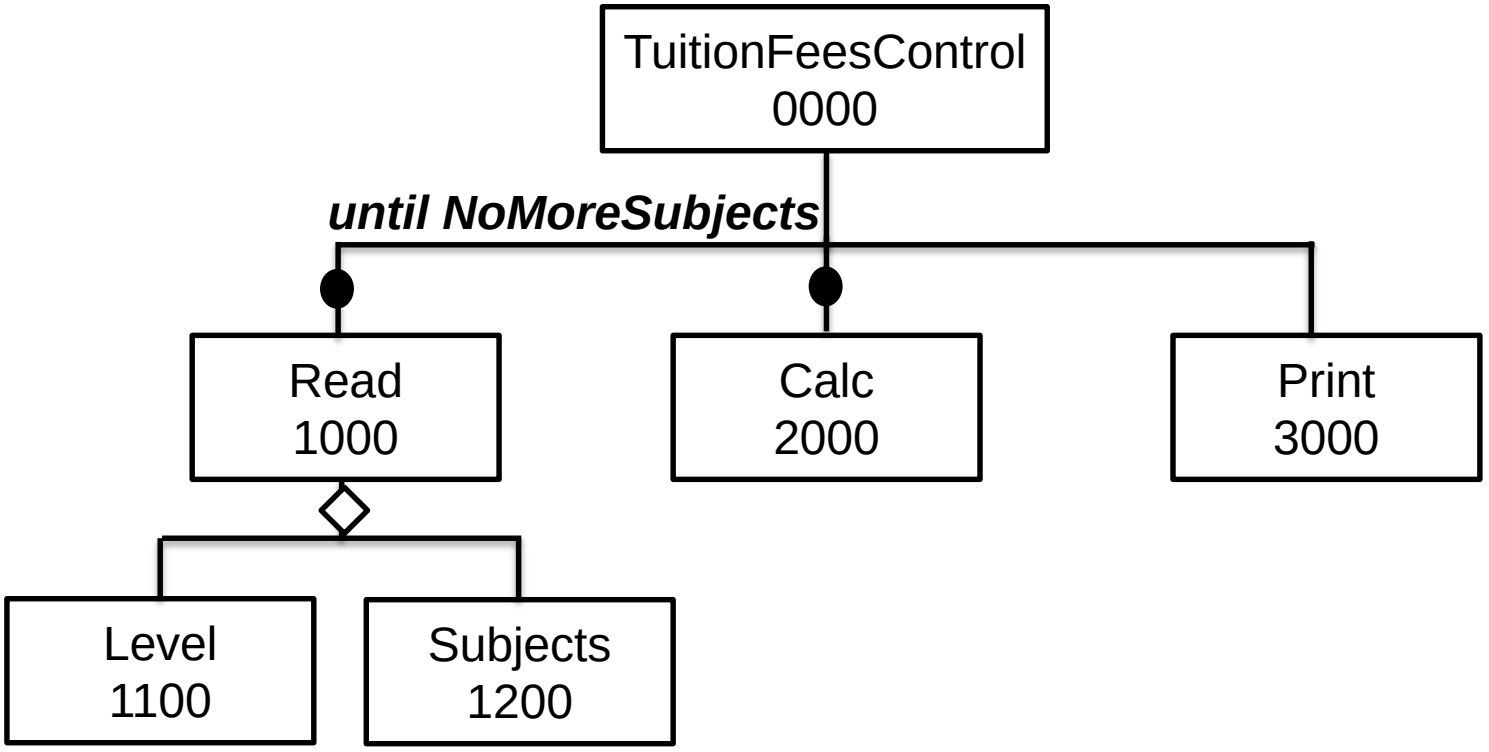
IC – Procedural Programming



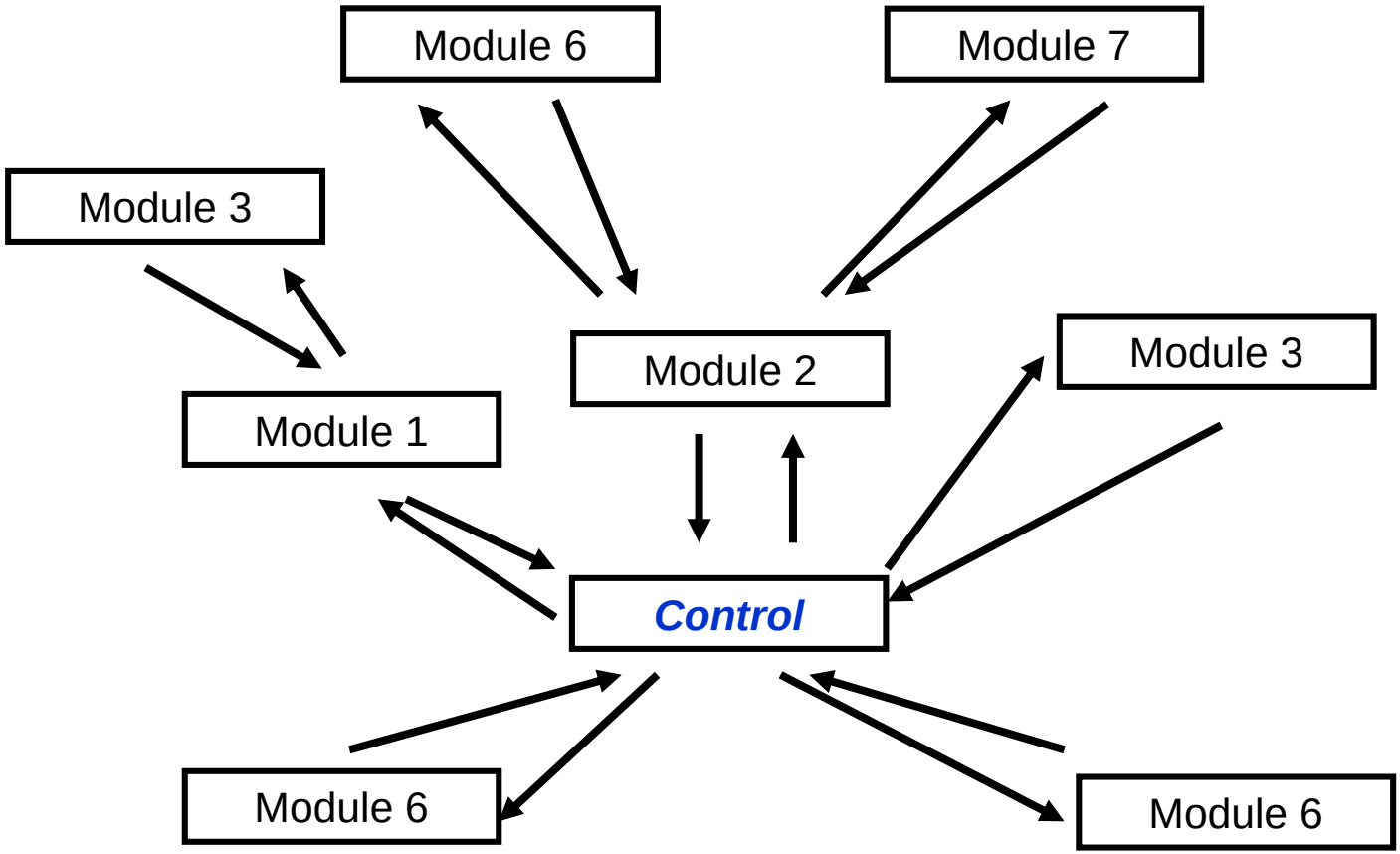
IC – Procedural Programming



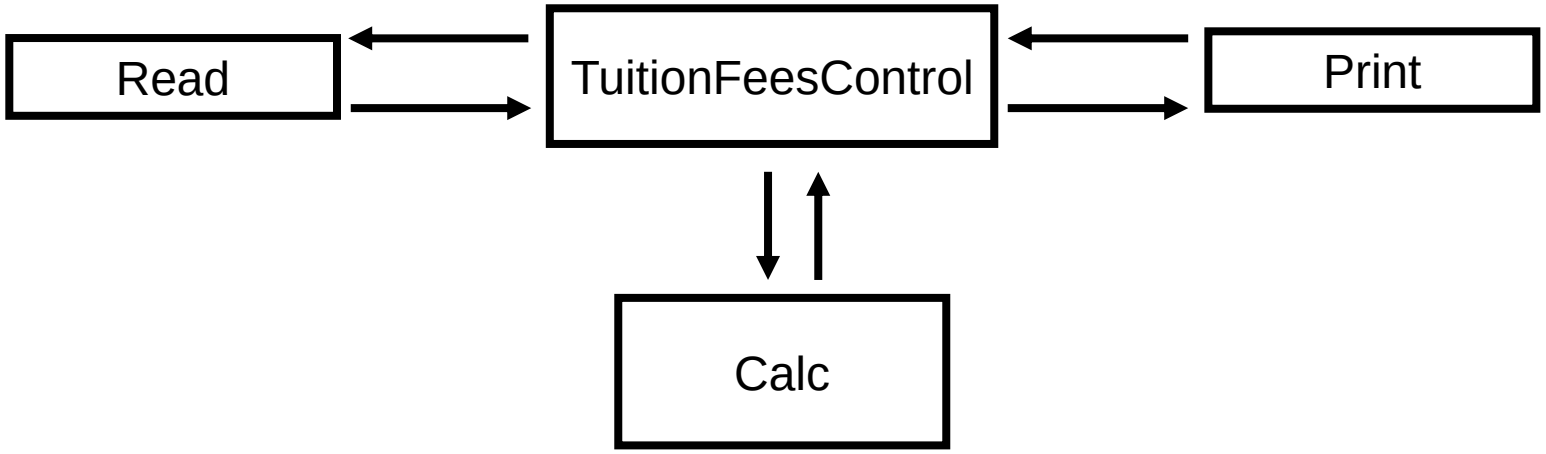
IC – Procedural Programming



IC – Object Oriented Programming



IC – Object Oriented Programming



What is IPO?

IPO (Input – Processing - Output)

- **Extends information in PAC and modules in IC**
- **Have 4 parts**

- **Emphasizing the three components of problem (input, processing and output)**

IPO (Input-Processing-Output)

Input	Processing	Module reference Number / Names	Output
All input data from PAC - section 1	All processing in steps from PAC - section 3 and 4	Module name from IC	All output from PAC - section 1 and 2

Example: IPO (Input-Processing-Output)

Problem: Calculate fees of a student in a tuition center. User need to insert level of study (1 = UPSR, 2 = PT3, 3 = SPM and 4 = STPM) and subject (1 = BM, 2 = BI, 3 = Math, 4 = Science etc.)

Input	Processing	Module reference	Output
level subject	1. Enter level 2. Enter subject 3. Calculate fees 4. Print fees 5. End	Read Read Calc Print TuitionFeesControl	Tuition fees

Example: IPO (Input-Processing-Output)

Problem: Calculate average of 3 numbers

Input	Processing	Module reference	Output
Number1 Number2 Number3	1. Enter Number1 2. Enter Number2 3. Enter Number3 4. Calculate average = (Number1+Number2 +Number3)/3 5. Print average 6. End	Read Read Read Calc Print AverageControl	average

Try This!

Problem:

1. Write a Problem Analysis Chart (PAC) to find an area of a rectangle where area = (1/2) * height * length. Then create IC and IPO.

2. Write a Problem Analysis Chart (PAC) to convert the distance in miles to kilometers where 1.609 kilometers per mile. Then create IC and IPO.

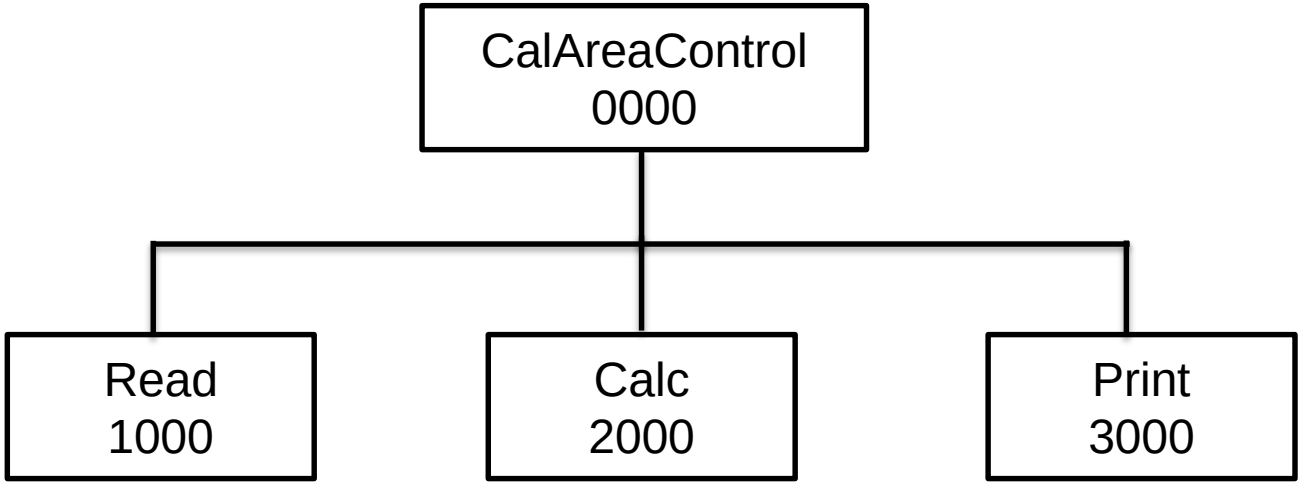
Answer IPO

Answer Problem 1:

Given Data	Required Result
height, length	area
Processing Required	**Solution Alternative**
area = (1/2) * height * length	i. Define the height and length as constants. ii. *Define the height and length as input values

Answer IC

Answer Problem 1:



Answer IPO

Answer Problem 1:

Input	Processing	Module	Output
height length	1. Enter height 2. Enter length 3. Calculate area = (1/2) * height x length 4. Display area 5. End	1000 1000 2000 3000 0000	Area of a rectangle

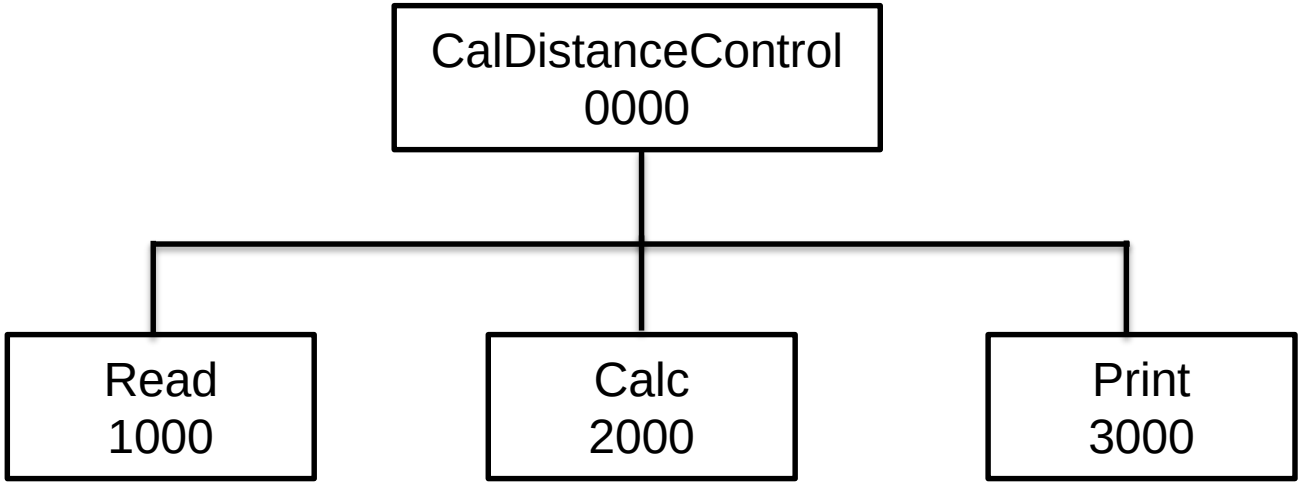
Answer

Answer Problem 2:

Given Data	Required Result
Distance in miles	Distance in kilometers
Processing Required	**Solution Alternative**
kilometers = 1.609 x miles	i. Define the miles as constants. ii. *Define the miles as input values

Answer IC

Answer Problem 2:



Answer IPO

Answer Problem 2:

Input	Processing	Module	Output
miles	1. Enter miles 2. Calculate kilometers = 1.609 x miles 3. Display kilometers 4. End	1000 2000 3000 0000	Distance in kilometers

Conclusion / What we have learn today?

- Problem Analysis Charts – a beginning analysis of the problem
- Interactivity Charts – shows the overall layout or structure of the solution
- IPO Chart – shows the input, the processing and the output

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