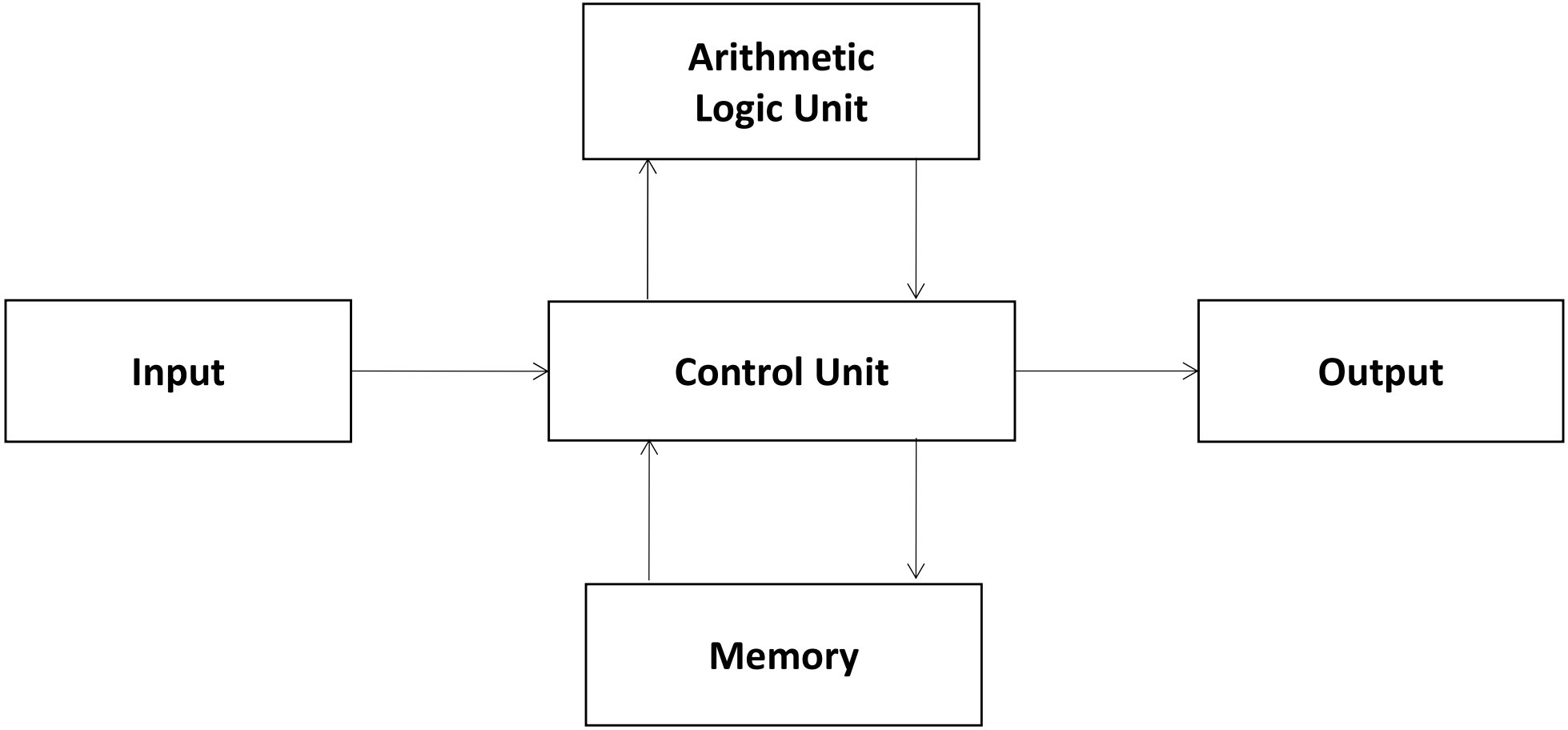
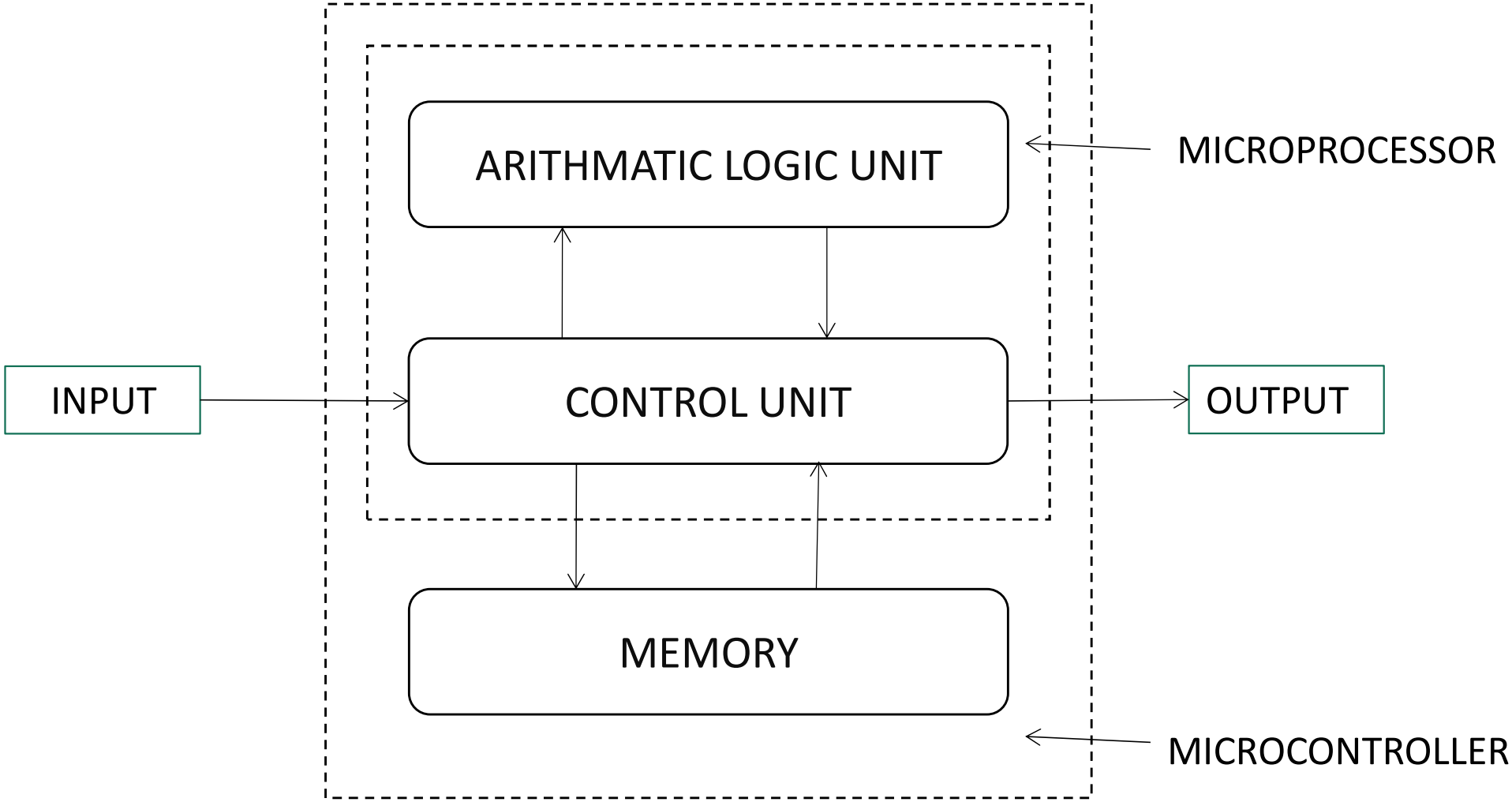
Do you know computer organization?



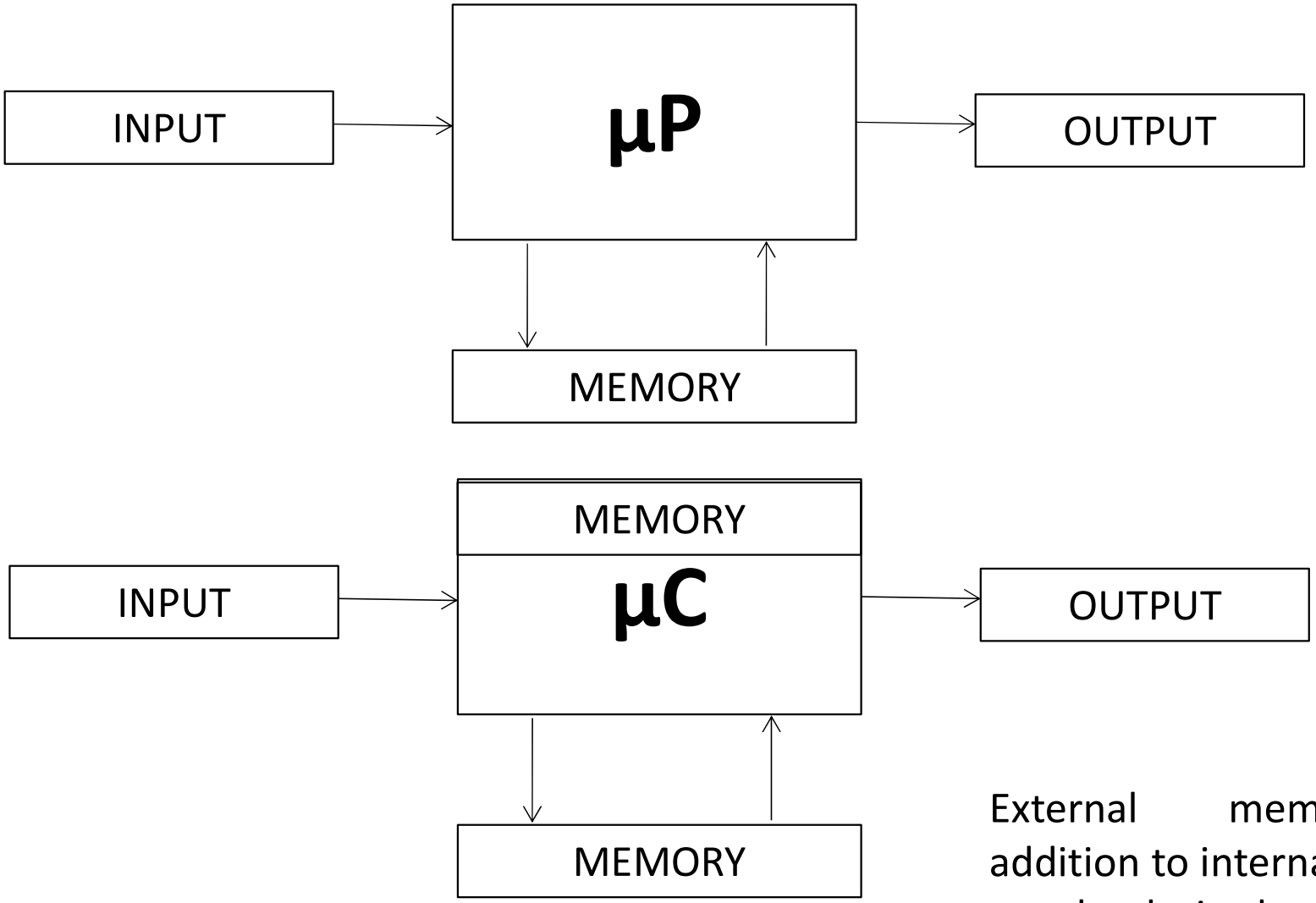
- How does it work?
- Map it’s units in your personal computer –
    - Input
    - Output
    - Memory
    - ALU

Software – System software & Application software

Microprocessor VS Microcontroller

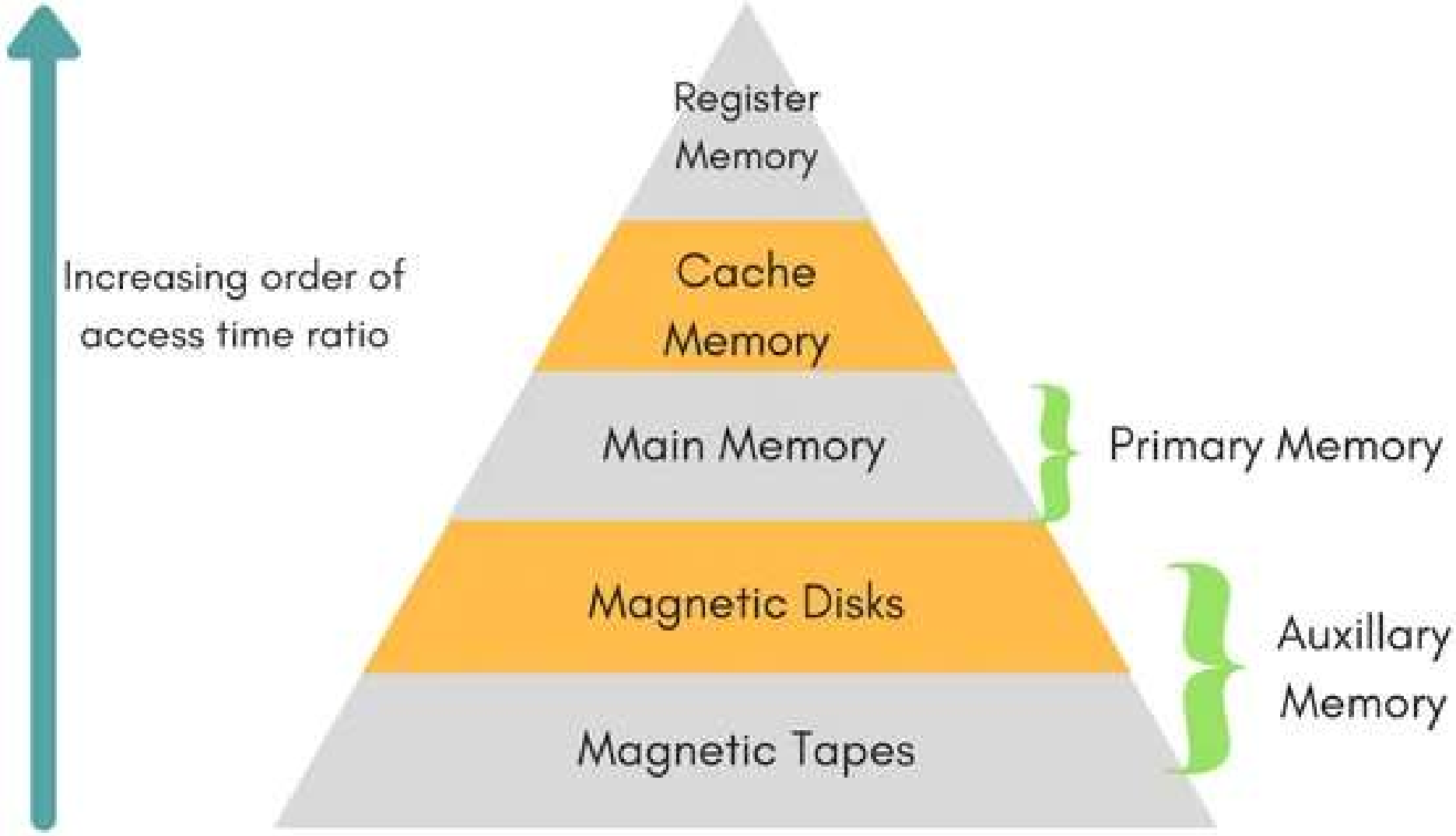


Microprocessor Based System



External memory in addition to internal memory may be desired

Memory


Increasing order of access time ratio
Register Memory
Cache Memory
Main Memory
Magnetic Disks
Magnetic Tapes
Primary Memory
Auxillary Memory

ALGORITHMS AND FLOWCHARTS

ALGORITHMS AND FLOWCHARTS

- A typical programming task can be divided into two phases:

- ***Problem solving phase***
  - produce an ordered sequence of steps that describe solution of problem
  - this sequence of steps is called an ***algorithm***

- ***Implementation phase***
  - implement the program in some programming language

Steps in Problem Solving

- First produce a general algorithm (one can use ***pseudocode***)

- Refine the algorithm successively to get step by step detailed ***algorithm*** that is very close to a computer language.

- ***Pseudocode*** is an artificial and informal language that helps programmers develop algorithms. Pseudocode is very similar to everyday English.

Pseudocode & Algorithm

- **Example 1:** Write an algorithm to determine a student's final grade and indicate whether it is pass or fail. The final grade is calculated as the average of four marks.

Pseudocode & Algorithm

Pseudocode:

- *Input a set of 4 marks*
- *Calculate their average by summation and division by 4*
- *if average is below 50*

  Print “FAIL”

  else

  Print “PASS”

Pseudocode & Algorithm

- Detailed Algorithm

Step 1: Input M1,M2,M3,M4

Step 2: GRADE ← (M1+M2+M3+M4)/4

Step 3: if (GRADE < 50) then

Print “FAIL”

else

Print “PASS”

endif

The Flowchart

- (Dictionary) A schematic representation of a sequence of operations, as in a manufacturing process or computer program.

- (Technical) A graphical representation of the sequence of operations in an information system or program.
  - Information system flowcharts show how data flows from source documents through the computer to final distribution to users.
  - Program flowcharts show the sequence of instructions in a single program or subroutine. Different symbols are used to draw each type of flowchart.

The Flowchart

A Flowchart

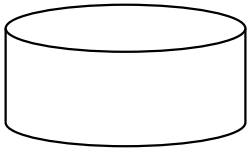
- shows logic of an algorithm
- emphasizes individual steps and their interconnections
- e.g. control flow from one action to the next

Flowchart Symbols

Terminal symbol - indicates the beginning and end points of an algorithm.

Process symbol - shows an instruction other than input, output or selection.

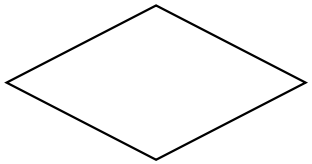
Input-output symbol - shows an input or an output operation.



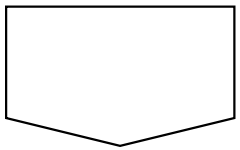
Disk storage I/O symbol - indicates input from or output to disk storage.

Printer output symbol - shows hardcopy printer output.

Flowchart Symbols cont…

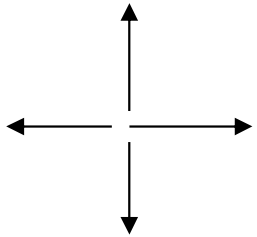


Selection symbol - shows a selection process for two-way selection.



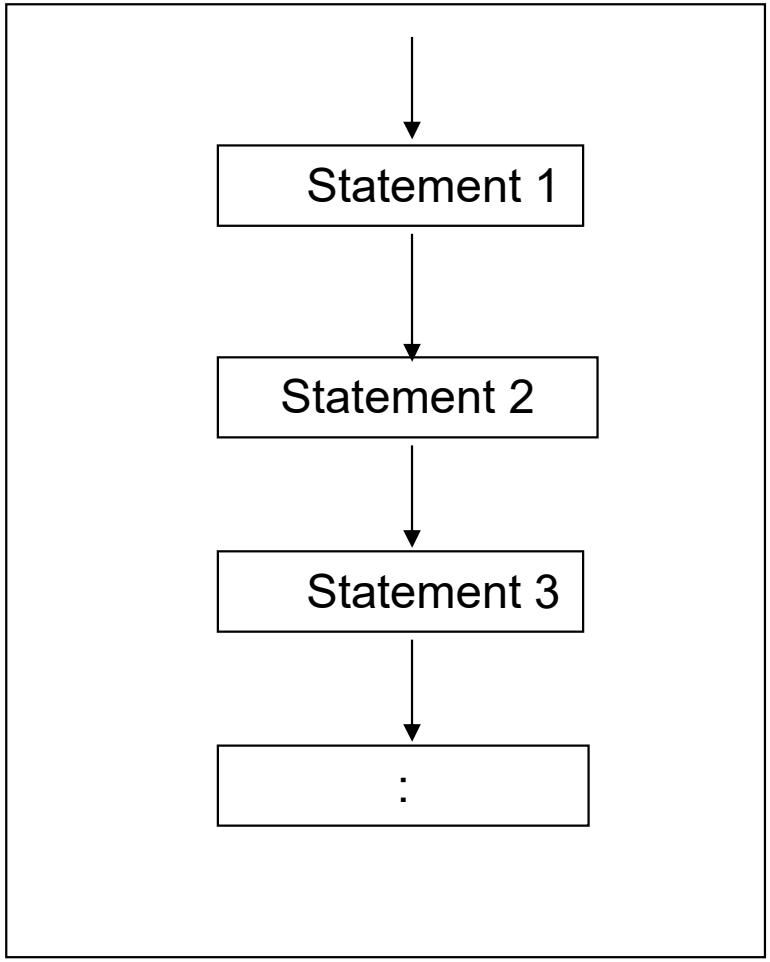
Off-page connector - provides continuation of a logical path on another page.

On-page connector - provides continuation of logical path at another point in the same page.

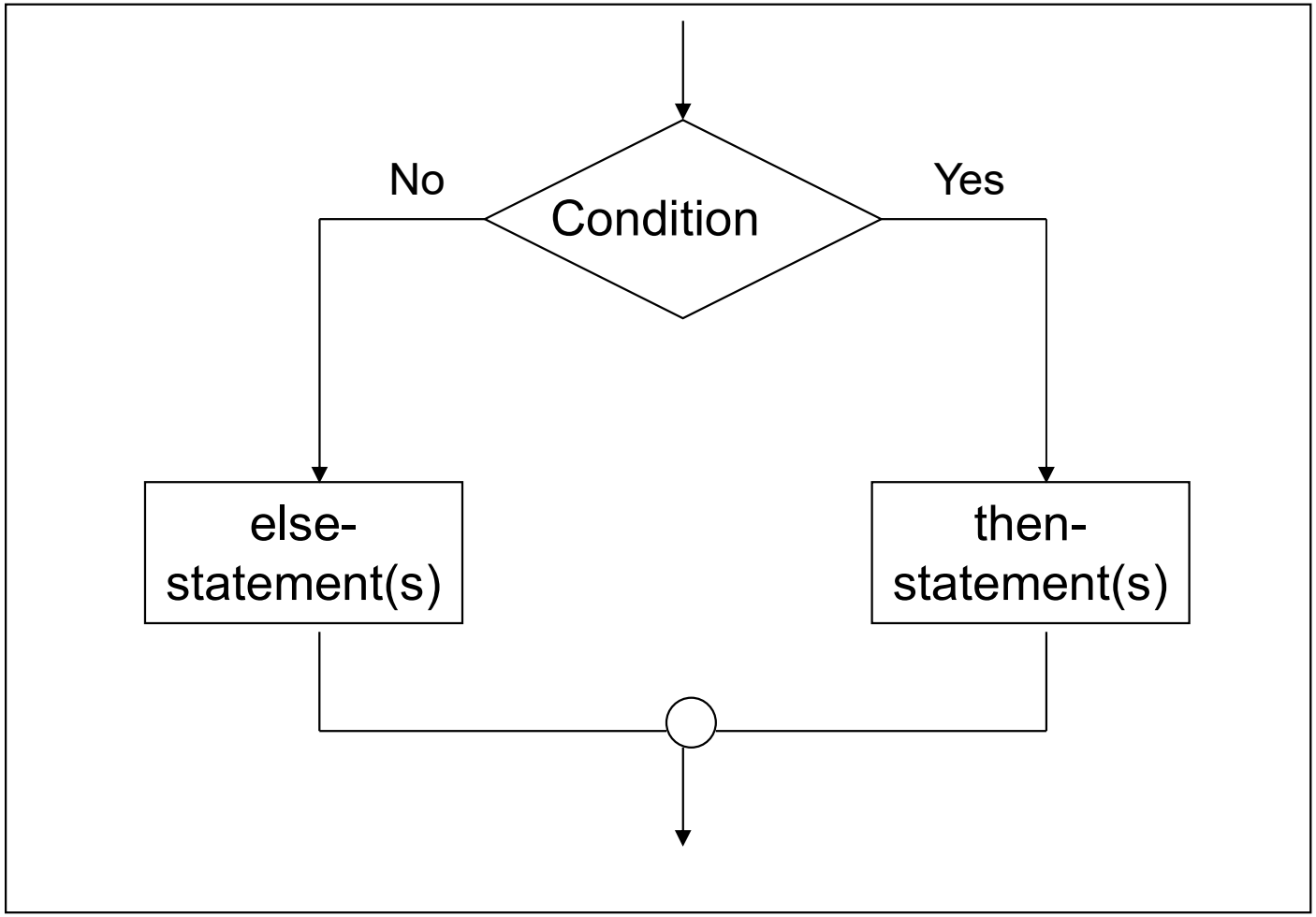


Flow lines - indicate the logical sequence of execution steps in the algorithm.

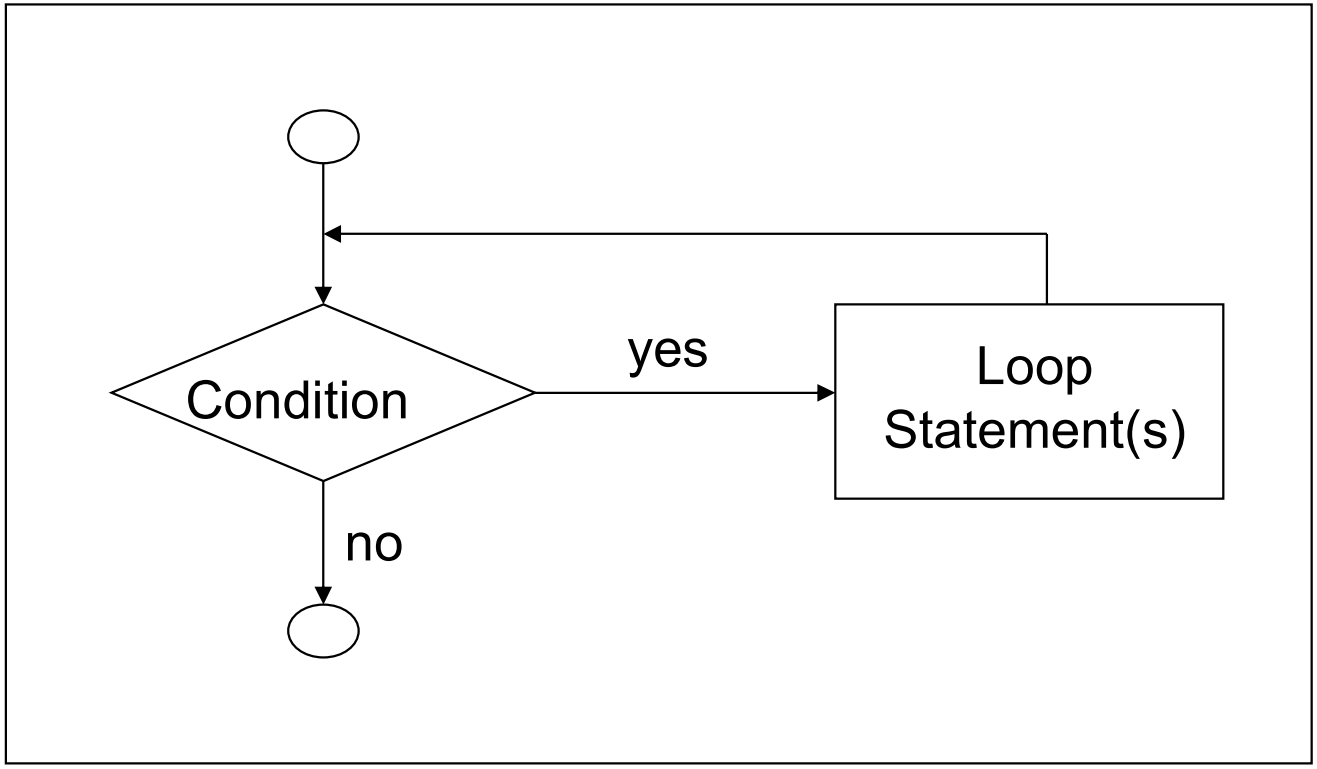
Flowchart – sequence control structure



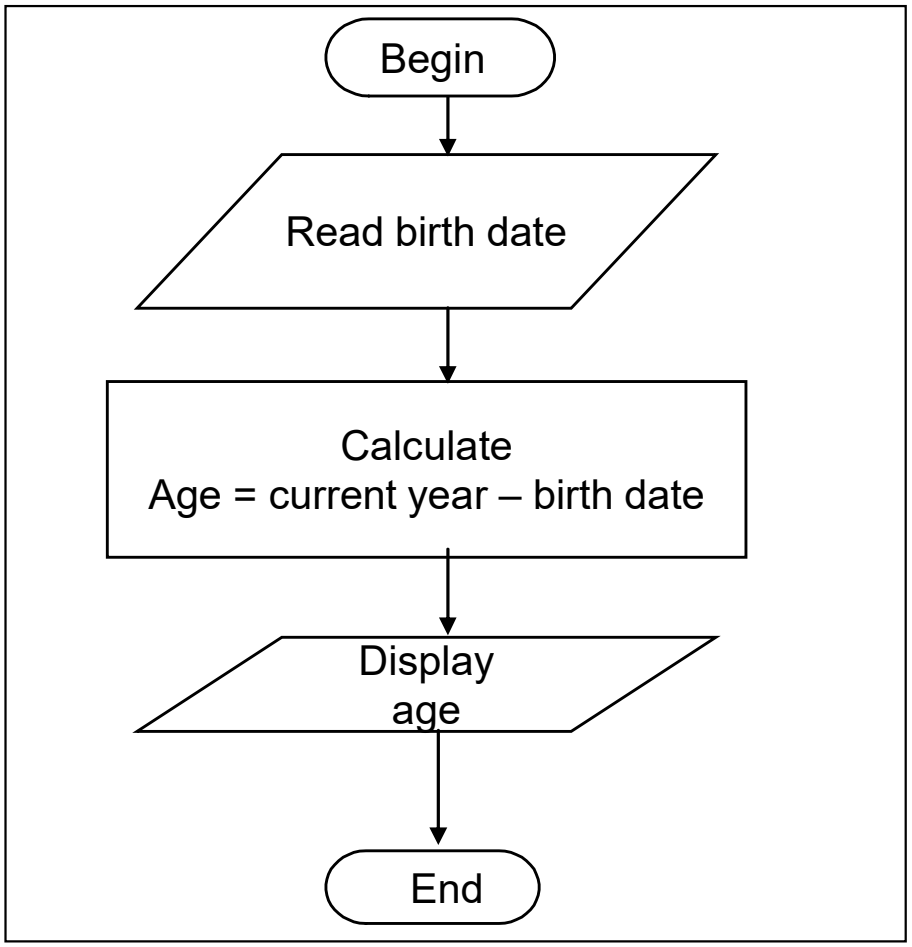
Flowchart – selection control structure



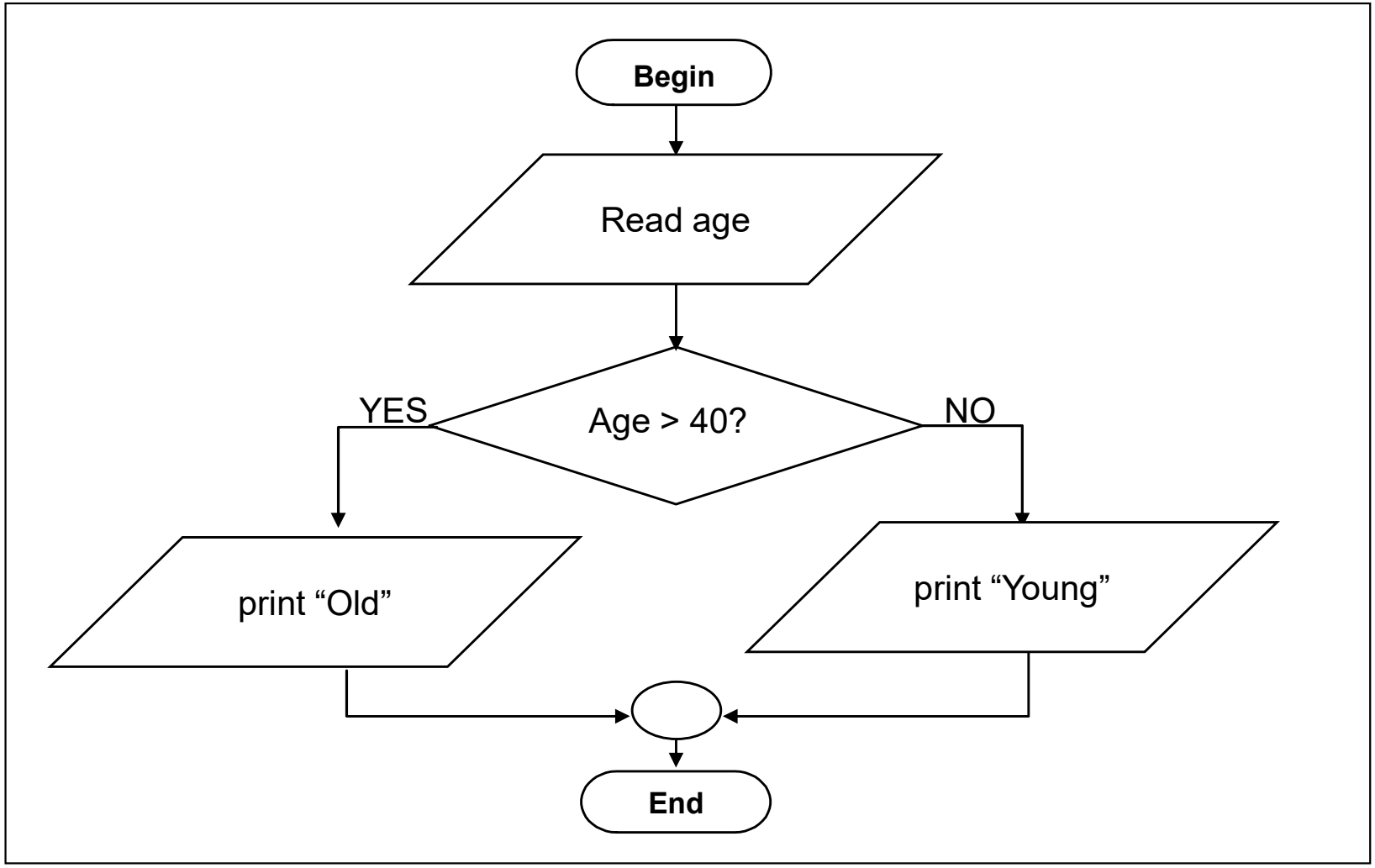
Flowchart – repetition control structure



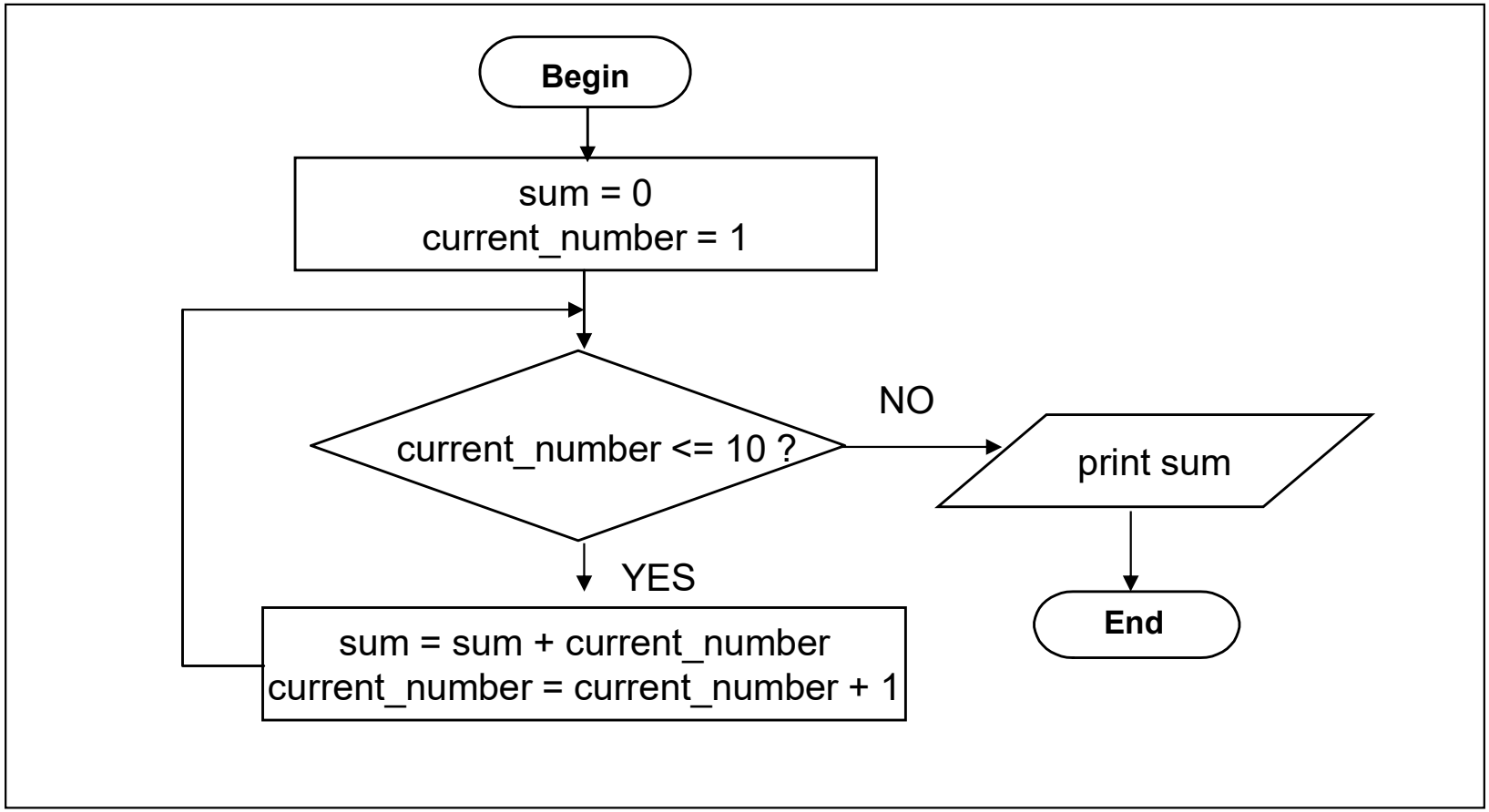
Flowchart – Calculating age from birth Year



Flowchart – example 2



Flowchart – Sum of first 10 Natural Numbers



Example 4

- Write an algorithm and draw a flowchart that will calculate the roots of a quadratic equation

$$ax^2 + bx + c = 0$$

- Hint: **d** = sqrt ($b^2 - 4ac$), and the roots are: ***x*1** = (–*b* + *d*)/2*a* and ***x*2** = (–*b* – *d*)/2*a*

Exercises: Algorithm & Flowchart

1.) Create an algorithm and a flowchart that will accept/read two numbers and then display the bigger number.

Exercises: Algorithm & Flowchart

2.) Write an algorithm and draw a flowchart to find the area of a Circle of radius r. Only radius between 1 and 100 should be accepted. If user inputs incorrect value more than 5 times, program should exit.

Exercises: Algorithm & Flowchart

3.) Create an algorithm and a flowchart that will compute the sum of two numbers. If the sum is below or equal to twenty, two numbers will be entered again. If the sum is above 20, it will display the sum.

Assignment 1

1. Create an algorithm and a flowchart that will output for g.c.d.
2. Create an algorithm and a flowchart that will output the factorial of a given number.
3. Create an algorithm and a flowchart that will output the Fibonacci series up to a given number.
4. Create an algorithm and a flowchart that will output all the prime numbers between 2 numbers.