Al-Mustaqbal University
College of Engineering Technology
Cybersecurity Techniques Engineering Department

Programming Essential

Lecture 2

Programming languages, Algorithms Development – Pseudo-code and Flowchart

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Programming languages

What is the programming?

❑Programming is the process of creating a set of instructions that tell a computer how to perform a task.

❑We can program using a variety of computer programming languages. For example: C, C++, Java, Python, etc.
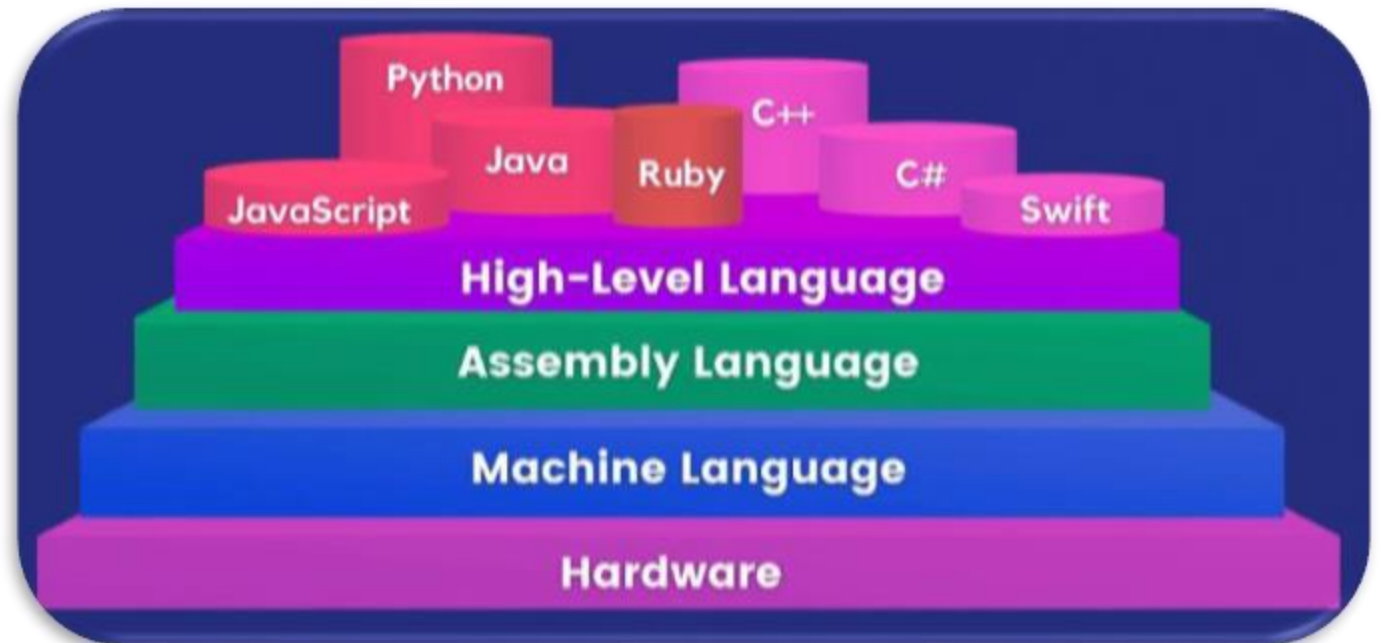
Why is it important?

❑Nowadays, software algorithms have become embedded in systems of all kinds: transportation, medical, telecommunications, military, industrial, entertainment, office machines, and many other fields and applications.
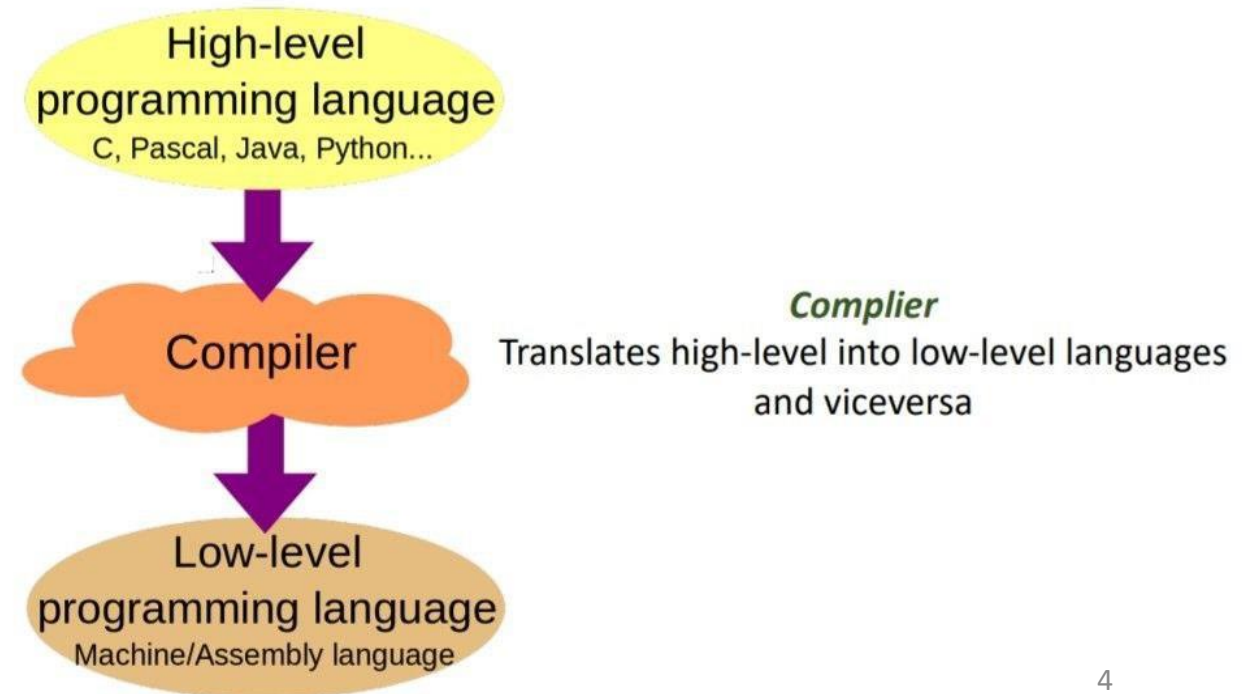
Programming languages:

❑ Programmers write instructions in various programming languages, some directly understandable by computers and others requiring intermediate translation steps.

❑ Hundreds of computer languages are in use today. These may be divided into three general types:

➢ Machine languages
➢ Assembly languages
➢ High-level languages

Compilation –> Translation

❑To speed the programming process, high-level languages were developed in which single statements could be written to accomplish substantial tasks.

❑Translator programs called compilers convert high-level language programs into machine language.

❑High-level languages allow programmers to write instructions that contain commonly used mathematical notations.

High-level
programming language
C, Pascal, Java, Python...

Compiler

Compler
Translates high-level into low-level languages
and viceversa

Low-level
programming language
Machine/Assembly language

Big Data – Byte Measurement

❑The smallest capacity of computer unit is measured by what called bit. A bit is either '0' or '1'.

➢1 = there is a volt

➢0 = there is no volt.

Name	Equal to:	Size in Bytes
Bit	1 bit	1/8
Nibble	4 bits	1/2 (rare)
Byte	8 bits	1
Kilobyte	1,024 bytes	1,024
Megabyte	1,024 kilobytes	1,048,576
Gigabyte	1,024 megabytes	1,073,741,824
Terrabyte	1,024 gigabytes	1,099,511,627,776
Petabyte	1,024 terrabytes	1,125,899,906,842,624
Exabyte	1,024 petabytes	1,152,921,504,606,846,976
Zettabyte	1,024 exabytes	1,180,591,620,717,411,303,424
Yottabyte	1,024 zettabytes	1,208,925,819,614,629,174,706,176

What is an algorithm?

❖ In computer programming, an algorithm is a set of well-defined instructions to solve a particular problem.

❖ It takes a set of input and produces a desired output.

Step 1: Start

Step 2: Define the variables

Step 3: Read values of variables

Step 4: Process
- math operations
- logic operations
- comparisons

Step 5: Display result

Step 6: End

1. بداية

2. تعريف المتغيرات

3. قراءة قيمة كل متغير

4. معالجة
- عمليات رياضية
- عمليات منطقية
- مقارنات

5. عرض/طباعة الناتج

6. نهاية

Algorithm to add two numbers

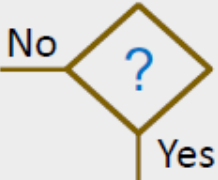❖We need to first write the steps (sequence of actins) that lead to performing the task.

❖For example, an algorithm to add two numbers:
  ➢Take two number inputs
  ➢Add numbers using the + operator
  ➢Display the result

Step #	Description
Step1	Start
Step2	Declare or define variables num1, num2, sum;
Step3	Read values num1 and num2
Step4	Add num1 and num2 and assign the results to sum sum ← num1 + num2;
Step5	Print sum
Step6	End

Flowchart Symbols

➢ A Flowchart is a graphical representation that shows the behavior (workflow) of an algorithm.

Flowcharts use standard shapes including the following:

Symbol	Name	Description
⬭	Start / End	An oval represents a **start** or **end** point
⟶	Arrows	A line is a connector that shows flow direction between the representative shapes
▱	Input /Output	A parallelogram represents **input** or **output**
▭	Process	A rectangular represents a **process** (calculation)
No ◇? Yes	Decision	A diamond indicates a **decision** (comparison)
◯	Connector	A circle is used to combine one part of the flowchart with another part

Adding two numbers

✓ Write the pseudo-code for algorithm to sum two numbers. Then draw the equivalent flowchart.
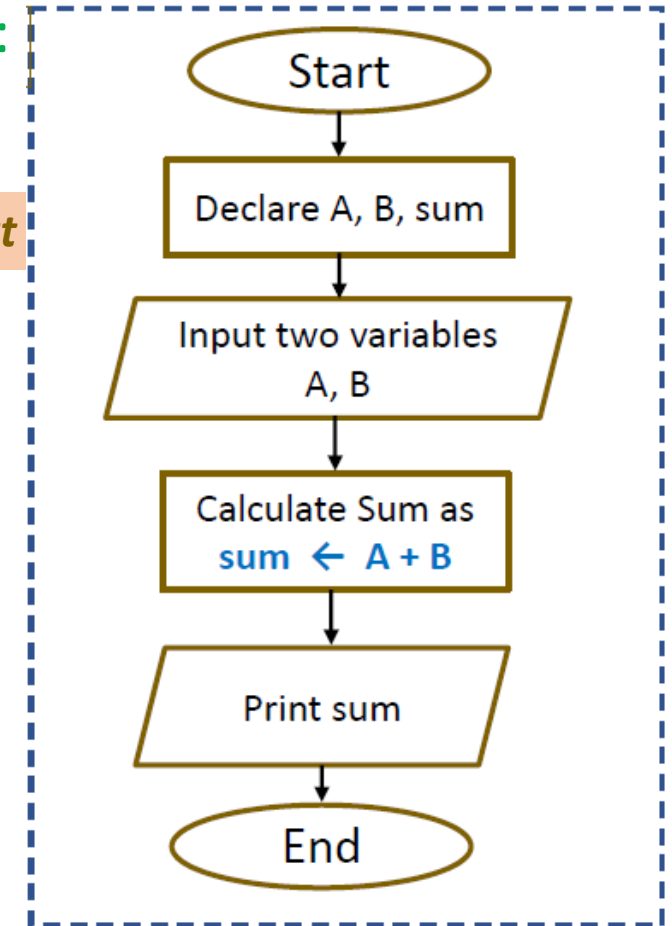
➤ Flowcharts use standard shapes including the following:

Ans:

Pseudo-code Algorithm

Step 1: START
Step 2: DECLARE variables num1, num2, sum;
Step 3: READ ~~variables~~ num1, num2;
Step 4: CALCULATE sum

   sum = num1 + num2;
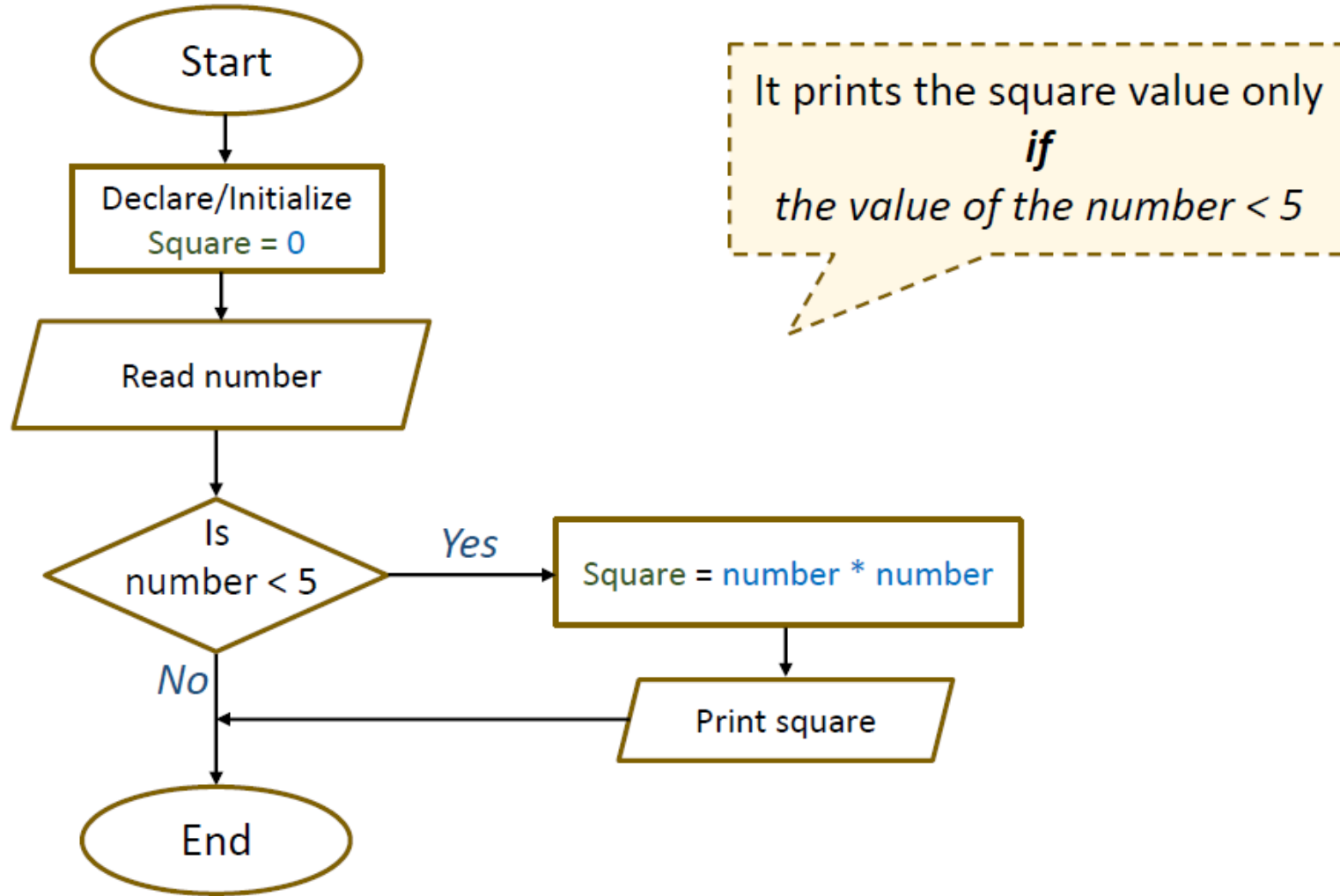
Step 5: PRINT sum
Step 6: END

Flowchart

Note:
➤ The ***pseudo-code*** and ***flowchart*** of an algorithm is not written for a particular programming language.
➤ They can be used to plan a solution before coding it.

Print if the condition met

❖ Draw the Flowchart to print the square of a number if the number is less than 5.

It prints the square value only
if
the value of the number < 5

Note:
➢ The lines and arrows in it show the sequence of steps and the relationship among them.

Difference between pseudo-code and flowchart

Main differences between Pseudo-code and Flowchart

❖ The pseudo-code is a high-level description of an algorithm while the flowchart is a graphical representation of an algorithm.

❖ An algorithm is a set of instructions for solving a problem or accomplishing a task.

❖ Every computerized device uses algorithms, which cut the time required to do things manually.

❖ There are three main ways or scenarios used in the programming. These are:

1) *Sequencing* – putting things in the right order

2) *Conditions* – performing different things depending on some rules

3) *Iteration (Looping)* – repeating operations

Sequencing

❖ Calculate the average of three input numbers.

Pseudo-code Algorithm

Step 1: Start
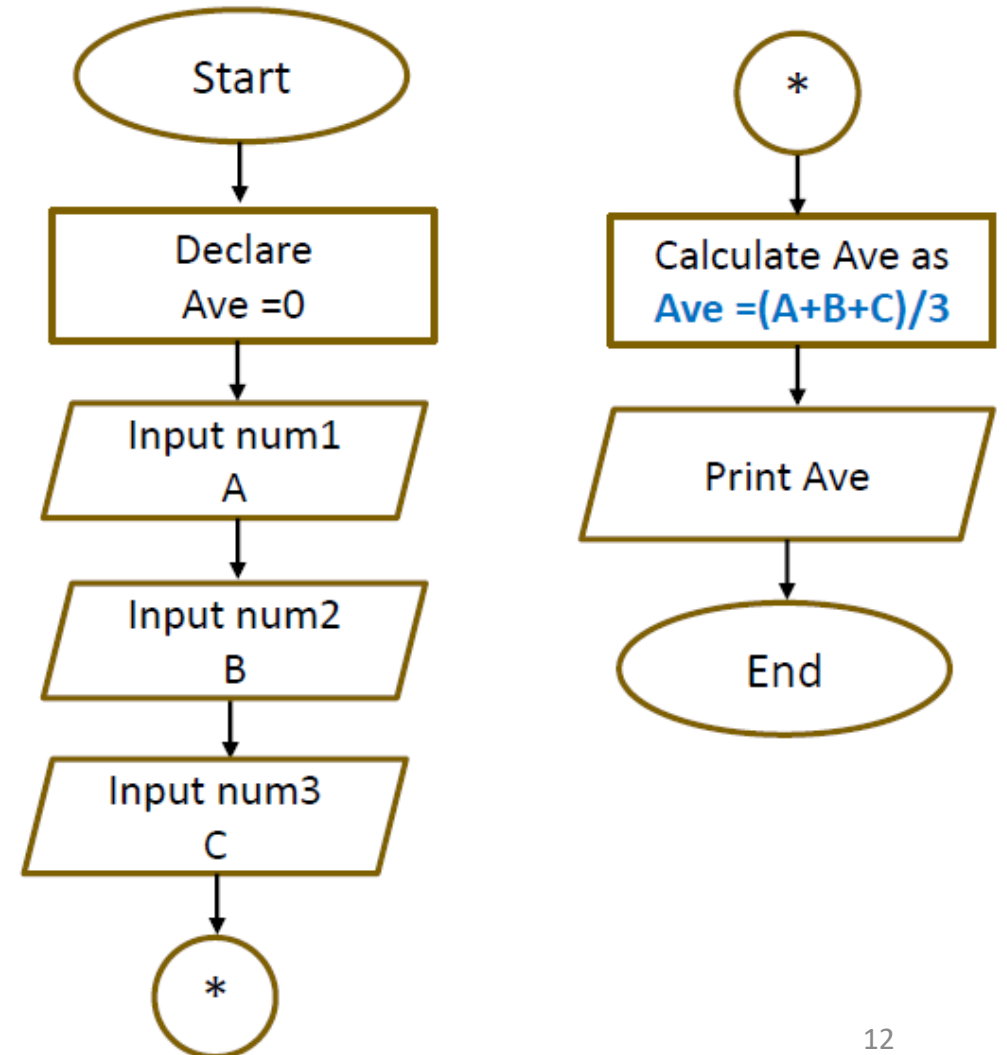Step 2: Declare variables Ave;
Step 3: Read variables num1, num2, num3;
Step 4: Calculate Ave

   Ave = (num1 + num2 + num3)/3;

Step 5: Print Ave
Step 6: End

Flowchart

Qualities of Good Algorithms

1. *Precision* – الدقة the steps of input and output should be precisely defined.

2. *Clarity* – الوضوح each step in the algorithm should be clear and unambiguous.

3. *Inputs/Outputs* – المدخلات والمخرجات has inputs that lead to the production of the output

4. *Effectiveness* – الفعالية Algorithms should solve problems in effective ways such that getting an

5. output from each step based on its inputs and outputs of the previous step

6. *Generality* – العمومية/ الشمول the algorithm should be written in such a way that it can be used in

7. different programming languages.

THANK YOU