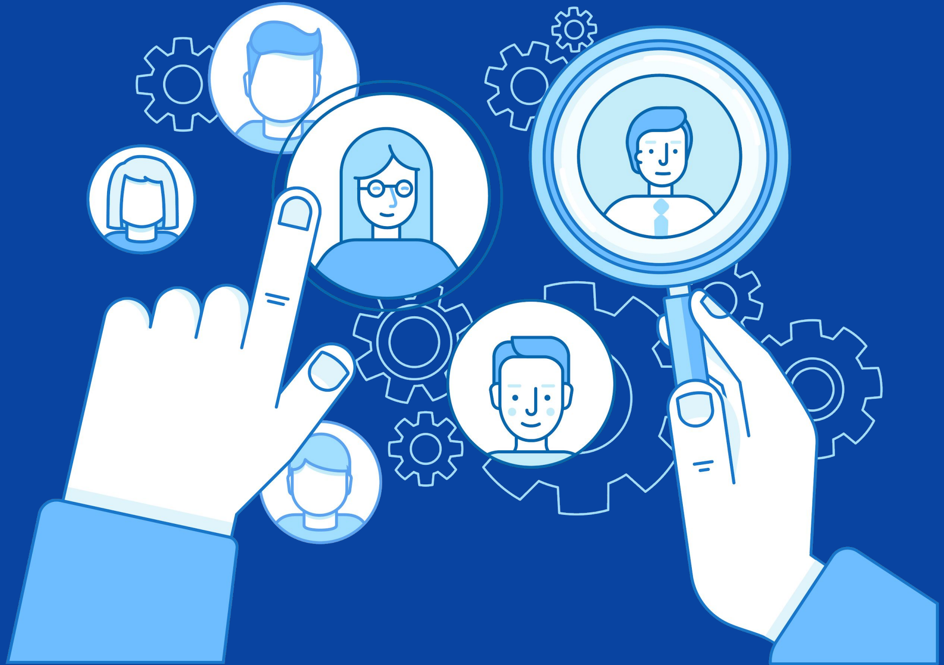
Digital Career Institute

Fundamentals - Programming



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Goal of the Submodule

The goal of this submodule is to help the learners understand the following:

- programming and programming languages.
- Algorithm
- different types of developers
- JSON
- XML- markup language

Topics

- Programming languages types
- Algorithm and programming
- Developers profiles
- JSON
- XML- markup language

Glossary

Term	Definition
POP	Procedural Oriented programming
OOP	Object Oriented Programming
UI	User Interface
UX	User Experience
JSON	JavaScript Object Notation

What is Programming?

Programming: is a way to communicate with computers.

Language: is made up of letters to words that describes something or share opinions or ideas with each other.

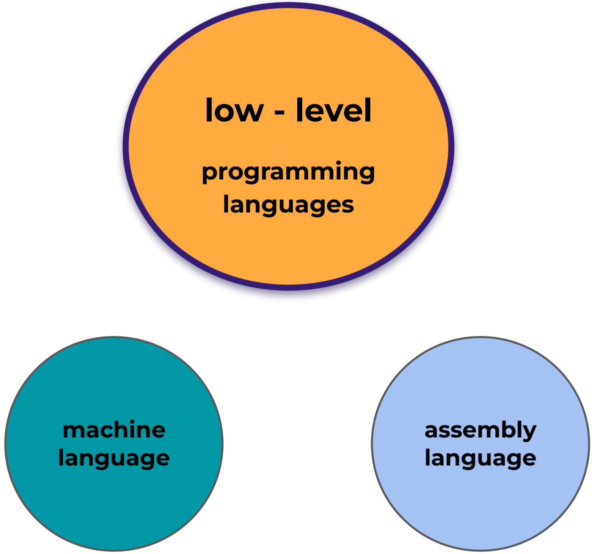
Programming Language : is a computer language that used by programmers aka developers to communicate with computers.

Types of Programming Languages

1- Low-level programming language

Is machine dependent (0s and 1s) programming language. Where the processor runs low-level directly with no need for a compiler or interpreter, so the program runs very fast.
Low-level is further division into:

- A- Machine language: Machine language is easier to read because it is normally displayed in binary or hexadecimal form (base 16) form. It does not require a translator to convert the programs because computers directly understand the machine language programs.


low - level
programming languages
machine language
assembly language

Types of Programming Languages

B- Assembly language

It represents the set of instructions in a symbolic and human-understandable form. It uses an assembler to convert the assembly language to machine language.

The advantage of assembly language is that it requires less memory and less execution time to execute a program.

Types of Programming Languages

Example assembly

```
0804892b jmp
0804892d nop
0804804c leave
0804804c ret
```

Types of Programming Languages

2- Middle-level programming languages

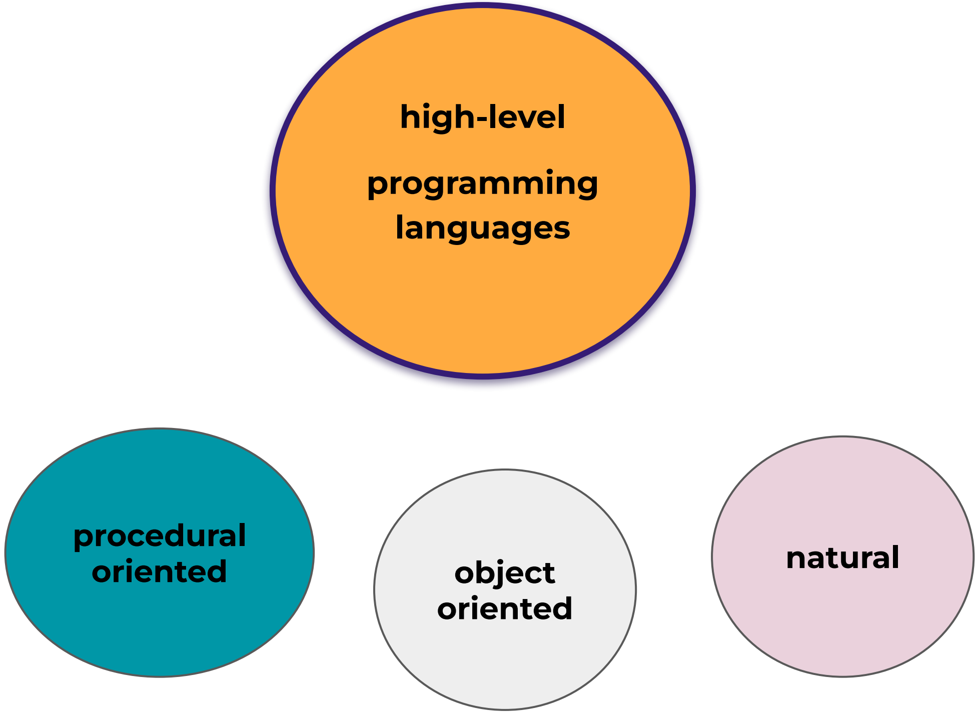
lie between the low-level programming languages and high-level programming languages. They are also known as intermediate programming languages and pseudo-languages.

A middle-level programming language has the advantage that it supports the features of high-level programming, it is a user-friendly language, and it is closely related to machine language and human language.

Types of Programming Languages

3- High-level programming languages are designed for developing user-friendly software programs and websites. These programming languages require a compiler or interpreter to translate the program into machine language (execute the program). The main advantage of high-level languages is that they are easy to read, write, and maintain.

High-level programming languages include Python, Java, JavaScript, PHP, C#, C++, Objective C, Cobol, Perl, Pascal, LISP, FORTRAN, and the Swift programming language.



high-level programming languages

procedural oriented

object oriented

natural

Types of Programming Languages

A high-level language is further divided into three parts:

- A- Procedural Oriented programming language
  POP is derived from structured programming and based upon the procedure call concept. It divides a program into small procedures called routines or functions.
  Example: C, Basic, Pascal, Fortran

ProTip: You need a programming editor like IDE, this app will help you write better and cleaner code.

Types of Programming Languages

- B- Object-Oriented Programming language: OOP is based upon the objects. In this programming language, programs are divided into small parts called objects.
  Example: C++, Java, Python, C#

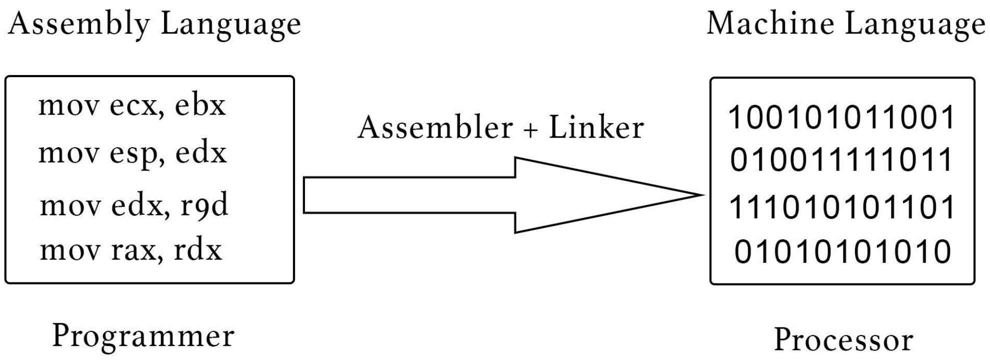
- C- Natural language processing which is a part of Computer Science, Human language, and Artificial Intelligence. It is the technology that is used by machines to understand, analyse, manipulate, and interpret human's languages.

Types of Programming Languages

At the core of the lesson

Lessons Learned:

- An assembly language is a type of low-level programming language that is intended to communicate directly with a computer's hardware



At the core of the lesson

Lessons Learned:

- A programming language is a formal language comprising a set of strings that produce various kinds of machine code output. Programming languages are one kind of computer language

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Self Study

Research on which programming languages are out there and their types

Algorithm

Algorithm

In computer programming terms, 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**.

It can be defined as simply **a set of steps used to complete a specific task**. They're the building blocks for programming, and they allow things like computers, smartphones, and websites to function and make decisions.

Algorithms are a great way of **automating computer decisions**.

Algorithm

In addition to being used by technology, a lot of things we do on a daily basis are similar to algorithms.
For example, algorithms resemble recipes. Recipes tell you how to **accomplish a task by performing a number of steps**.

Bake a Cake	Make Spaghetti
Preheat the oven	Boil water in a pot
Mix the ingredients	Add the spaghetti
Pour into a baking pan	Wait for it to cook
Put it in the oven	Drain the water
...	...

Algorithm

Programs work in a similar way. Their code is made up of **algorithms telling them what to do**.

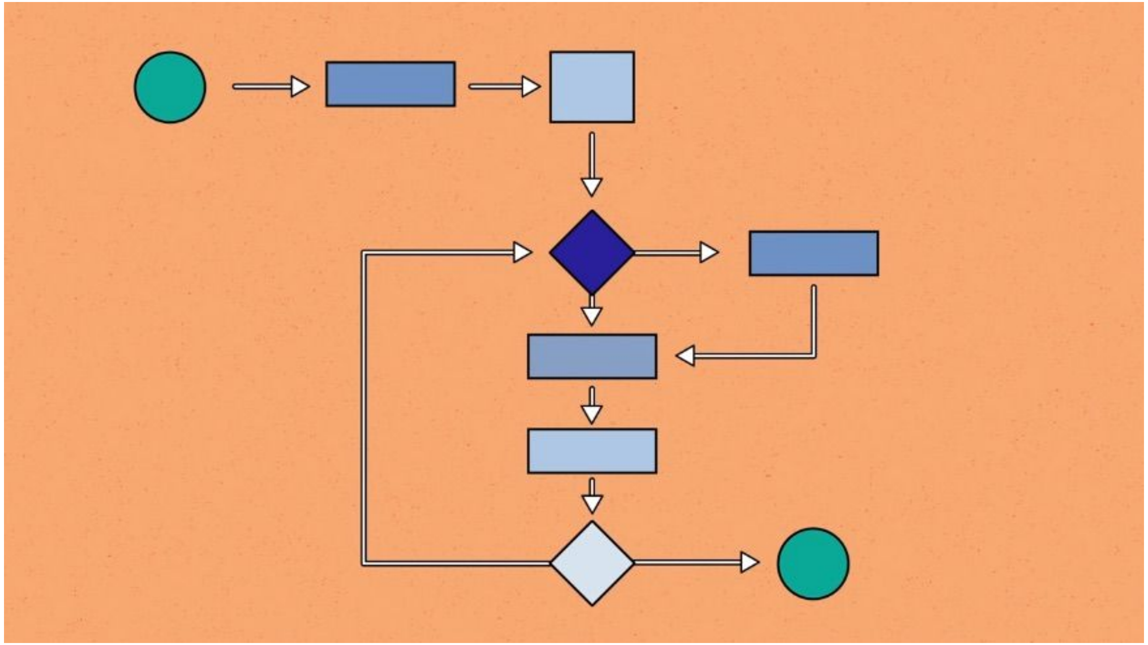
However, *algorithm* is a technical term with a more specific meaning than recipe, and calling something an algorithm means that the following properties are all true:

- An algorithm is an **unambiguous description** that makes clear **what has to be implemented.**
  - In a recipe, a step such as “Bake until done” is **ambiguous** because it **doesn’t explain what “done” means**.
  - In a computational algorithm, a step such as “Choose a large number” is **vague**: **what is large?** 1 million, 1 billion, or 100?
- An algorithm **expects a defined set of inputs.**
  - For example, it might require two numbers where both numbers are greater than zero. Or it might require a word, or a list of zero or more numbers.
- An algorithm **produces a defined set of outputs.**
  - It might output the larger of the two numbers, an all-uppercase version of a word, or a sorted version of the list of numbers.

Algorithm

- An algorithm is **guaranteed to terminate and produce a result**, always stopping after a finite time.
    - If an algorithm could potentially run forever, it wouldn't be very useful because you might never get an answer.
- Most algorithms are **guaranteed to produce the correct result.**
    - It's rarely useful if an algorithm returns the largest number 99% of the time, but 1% of the time the algorithm fails and returns the smallest number instead.
- If an algorithm imposes a **requirement on its inputs** (called a *precondition*), that **requirement must be met**.
    - For example, a pre condition might be that an algorithm will only accept positive numbers as an input. If the pre conditions aren't met, then the algorithm is allowed to fail by producing the wrong answer or never terminating.

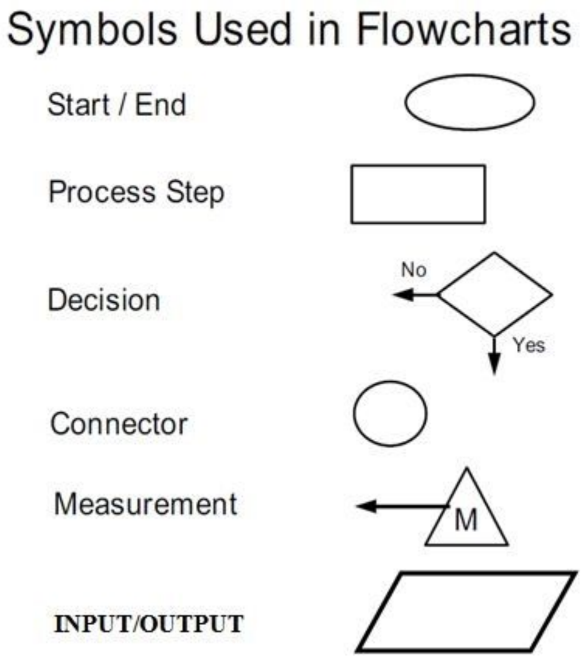
Algorithm



An Algorithm flow

Algorithm

Algorithm Flow Chart



Symbols Used in Flowcharts

Start / End

Process Step

Decision

Connector

Measurement

INPUT/OUTPUT

Algorithm

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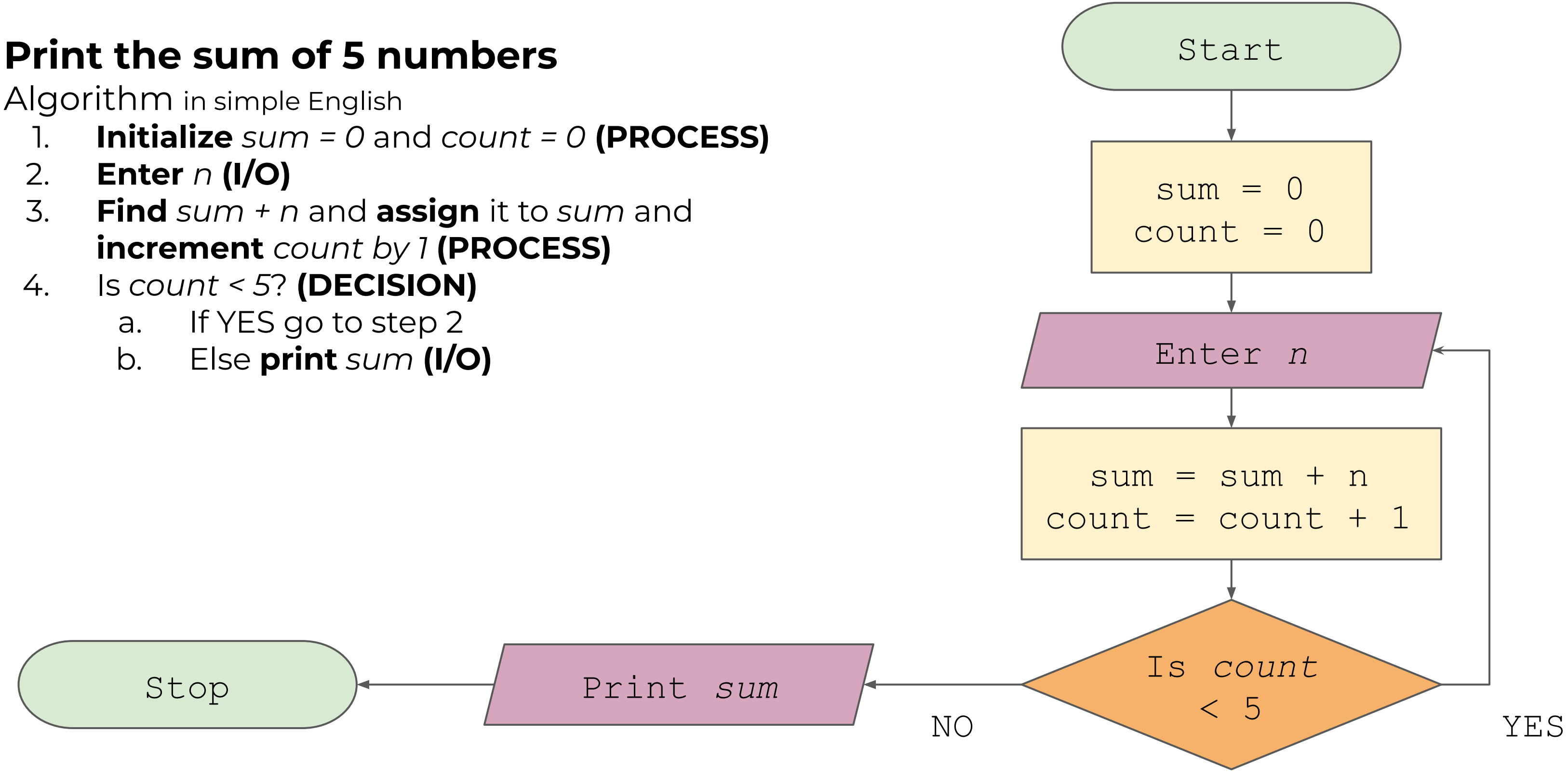
Print the sum of 5 numbers

Algorithm in simple English

1. **Initialize** *sum = 0* and *count = 0* **(PROCESS)**
2. **Enter** *n* **(I/O)**
3. **Find** *sum + n* and **assign** it to *sum* and **increment** *count by 1* **(PROCESS)**
4. Is *count < 5*? **(DECISION)**
    a. If YES go to step 2
    b. Else **print** *sum* **(I/O)**



Algorithm

Qualities of Good Algorithms

- **Input and output** should be **defined precisely**.
- Each step in the algorithm should be **clear and unambiguous**.
- Algorithms should be most effective among many different ways to **solve a problem**.

At the core of the lesson

Lessons Learned:

- An algorithm is a set of instructions for solving a problem or accomplishing a task.
- Every computerized device uses algorithms to perform its functions.
- Computer algorithms make life easier by trimming the time it takes to manually do things.
- Algorithms allow workers to be more proficient and focused, making slow processes more proficient.