Programming in Python

Part One: Prerequisites

Decoding “Programming”

What is computer programming?

We use computers to:

- Solve problems
- Play games
- Work effectively
- Perform repetitive tasks
- Store and recall information
- Create something new
- Connect with our friends and the world.

Understanding how to code puts all this power at our fingertips.

What can a piece of code do?

Computer programs—also called applications, or apps—tell computers what to do. A web app can tell the computer how to keep track of your favorite music; a game app can tell the computer how to display an epic battlefield with realistic graphics.

Just about
anything can
have a computer
in it!

Dive into the Computer Hardware

Can Computers understand English?

Nooooo!

A computer, like us, belongs to a country or a city that a human doesn't live in. It's so called "the machine universe". A computer can only understand language in zeros and ones.

These zeros and ones are called "Binary Digits".

Let's say, computers understand a language called "Machine Language".

Uh-oh! I don’t know machine language. So how do I communicate with a computer?

Here comes Assembly Language!

An assembly language is a low-level programming language designed for a specific type of processor.

A **processor**, or "**microprocessor**," is a small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output. While this may seem like a simple task, modern processors can handle trillions of calculations per second.

Assembly Language

ADD AX, 13

MOV BX, AX

SUB BX, 91

Assembly language is converted into executable machine code by a utility program referred to as an assembler.

Assembly Languages doesn’t seem to be a user-friendly language

High-level Languages

Programmers writing code in high level languages use a program called a compiler to transform their code into assembly language/machine language/object code.

Object Code is machine readable, or better to say machine executable code.

Examples: C, C++, Java, Python, etc.

Brownie Point: High-level language isn't processor dependent.

Compiler v/s Interpreter

Vaguely, the difference can be written as a one-liner as follows:

Interpreter translates program one statement at a time.

Compiler scans the entire program and translates it as a whole into machine code.

Which one's better?

Where does Python fit in?

Python is an interpreted, high-level, general-purpose programming language. It is dynamically typed and garbage-collected.

Revealing the Secret

Python is a general-purpose language

General-purpose, as the name suggests, is used for creating all types of programs.

Name the languages which do not fall into the general purpose bucket.

Python is an Interpreted Language

For the most part, Python is an interpreted language and not a compiled one, although compilation is a step.

Python code, written in .py file is first compiled to what is called bytecode which is stored with a .pyc or .pyo format.

This bytecode is a low-level set of instructions that can be executed by an interpreter.

Python is dynamically-typed

What's a dynamically-typed language?

x = 14 (dynamic)

int x = 14 (static)

In dynamic-typing, it is the job of the interpreter to check the validity of the variable types and operations performed. This happens at run-time.

Compile time is the time at which the source code is converted into an executable code

Run (Execution time) is the time at which the executable code starts running

An Example of a Run-time error

```
a = 7
if a == 6:
     print(1)
else:
     print(1 + “one”)
```

Output:

```
Error!!
TypeError: unsupported operand type(s) for +: 'int' and 'str'
```

Python does garbage collection

Garbage collection frees up memory space allocated to you, when the space used is no longer in use.

```
..hello_world.py..

x = 3

print(x)

--------------------

>>> python hello_world.py

>>> 3
```

Getting Started

Download Python

1. Get the latest version of Python from the concerned site
2. Follow the download instructions
3. Test if Python's working by typing python in your command prompt

```
samhitaalla@Samhitas-MacBook-Pro ~ $ python3
Python 3.8.10 (default, May  4 2021, 03:06:52)
[Clang 12.0.0 (clang-1200.0.32.29)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> a = 5
>>> print(a)
```

How to run programs in Python?

- Using the python prompt
- Write code in a file and run the file by prefixing your file name with “python”