**SNS COLLEGE OF ENGINEERING**
Kurumbapalayam (Po), Coimbatore – 641 107

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**


# 19IT103 – COMPUTATIONAL THINKING AND PYTHON PROGRAMMING

- **A readable, dynamic, pleasant, flexible, fast and powerful language**

# UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS

- **Python interpreter and interactive mode**, debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.


# Recap

- **Program** - A program is a sequence of instructions that specifies how to perform a computation.
- **Programming Language** - A programming language is a **computer language** that is used by **programmers (developers) to communicate with computers**.

# Basic Programming Instructions

- **input:** Get data from the keyboard, a file, or some other device.
- **output:** Display data on the screen or send data to a file or other device.
- **math:** Perform basic mathematical operations like addition and multiplication.
- **conditional execution:** Check for certain conditions and execute the appropriate code.
- **repetition:** Perform some action repeatedly, usually with some variation.

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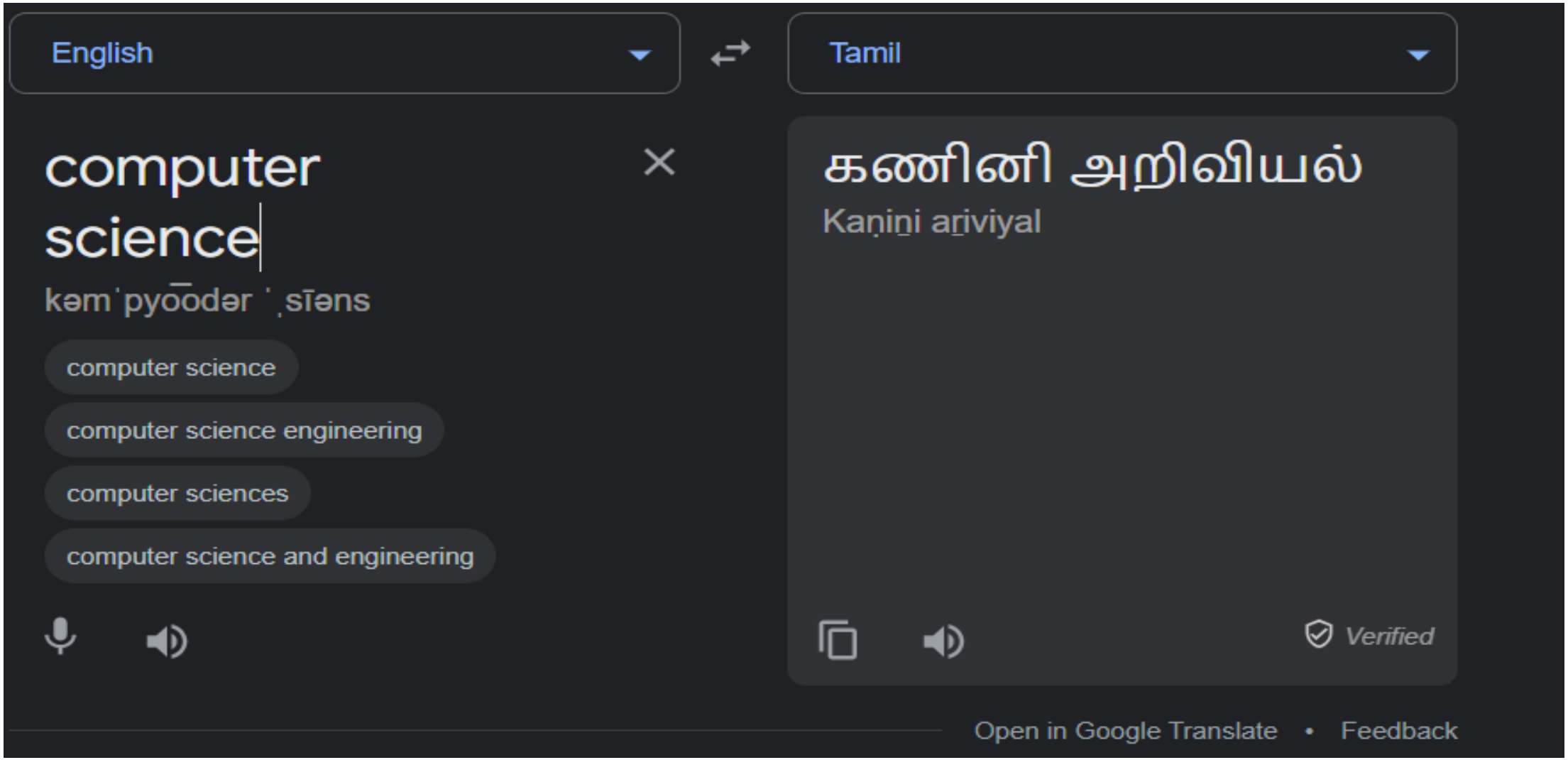
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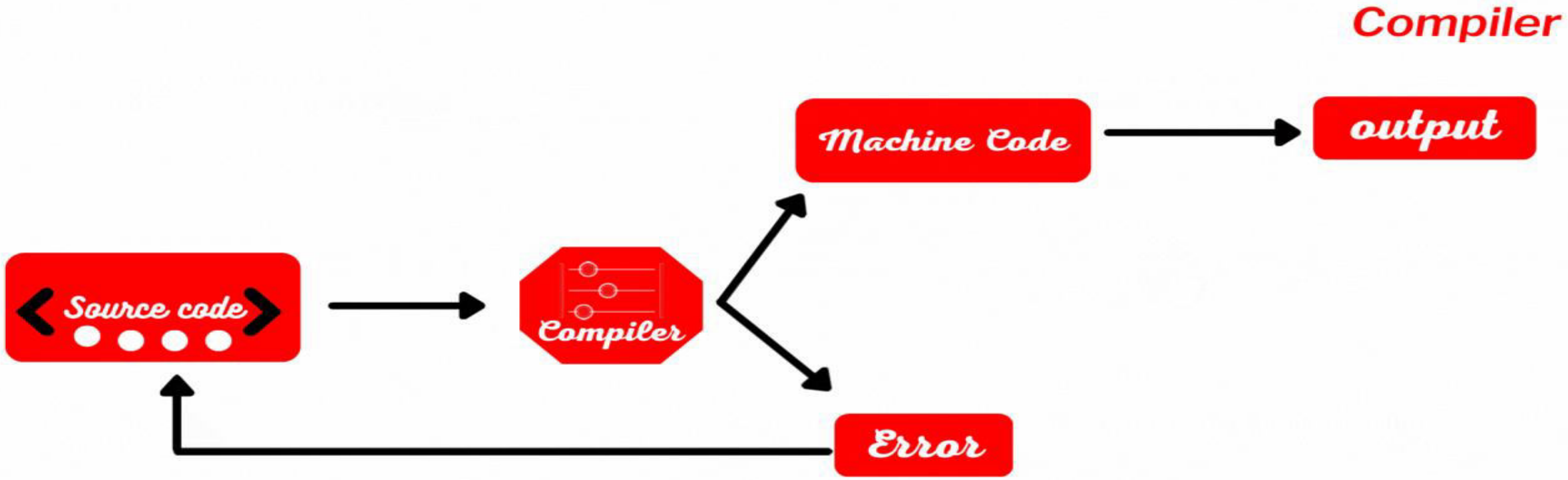
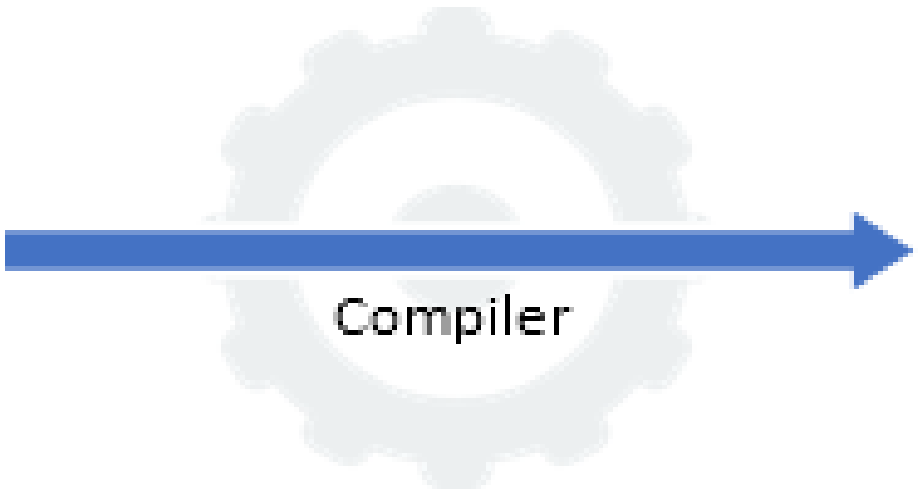
# Compilers

- A **compiler** is a program that translates source code into object code to be understood by a specific central processing unit (CPU).



# Compilers

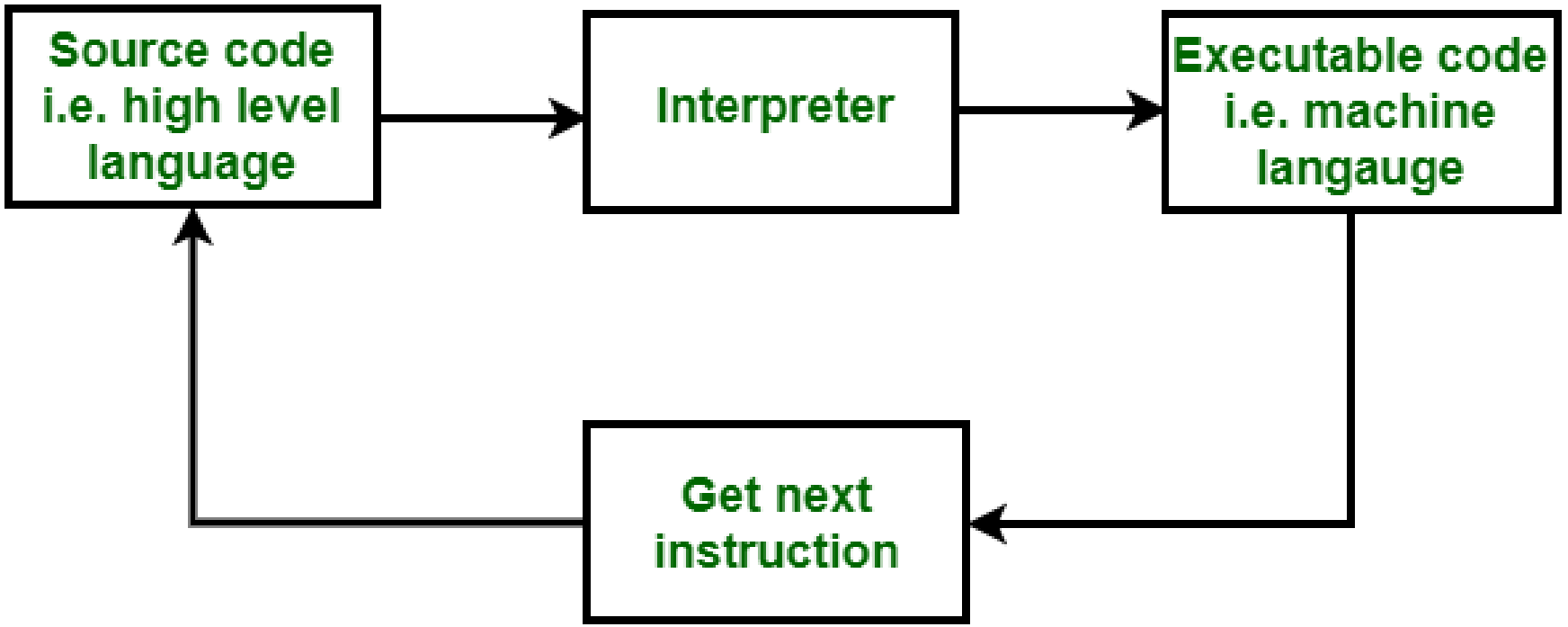
```
#include <stdio.h>

int main()
{
   printf(
        "Codeforwin");
   return 0;
}
```



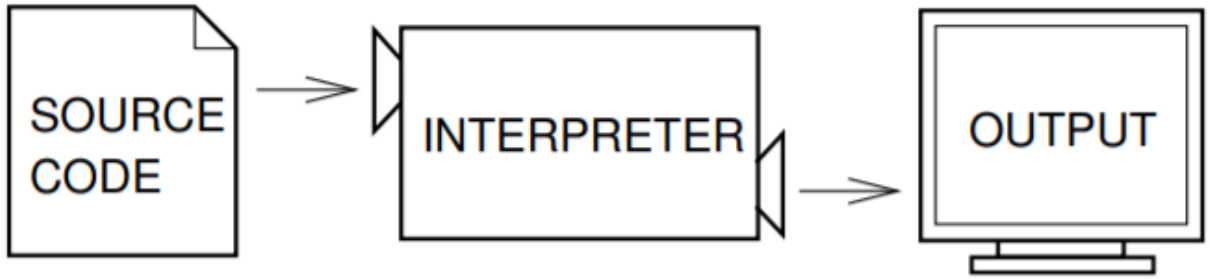

```
10101011100011001000
11110001111000110000
10101000111000101000
10110111010011111111
10001010101110010100
11101011010101010100
10101100010001110110
10101000111010100110
01010101000011011100
10111101011010111010
00011111111111000100
```

# Interpreter

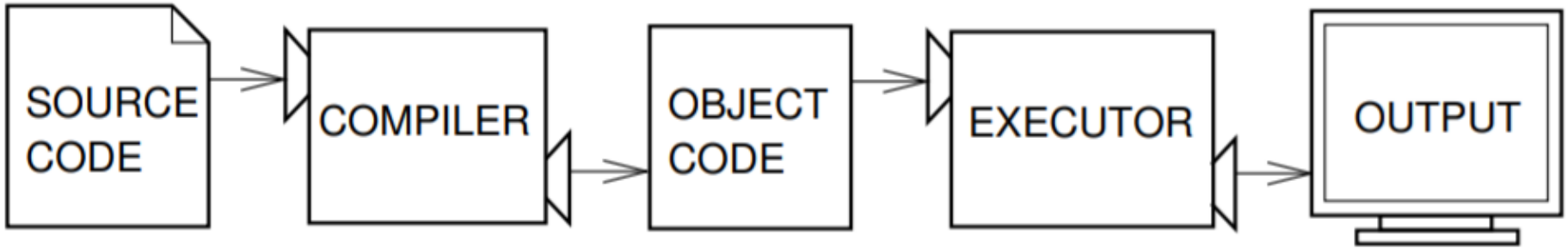
- An Interpreter directly executes instructions written in a programming or scripting language without previously converting them to an object code or machine code.



# Compiler & Interpreter – Block Diagram

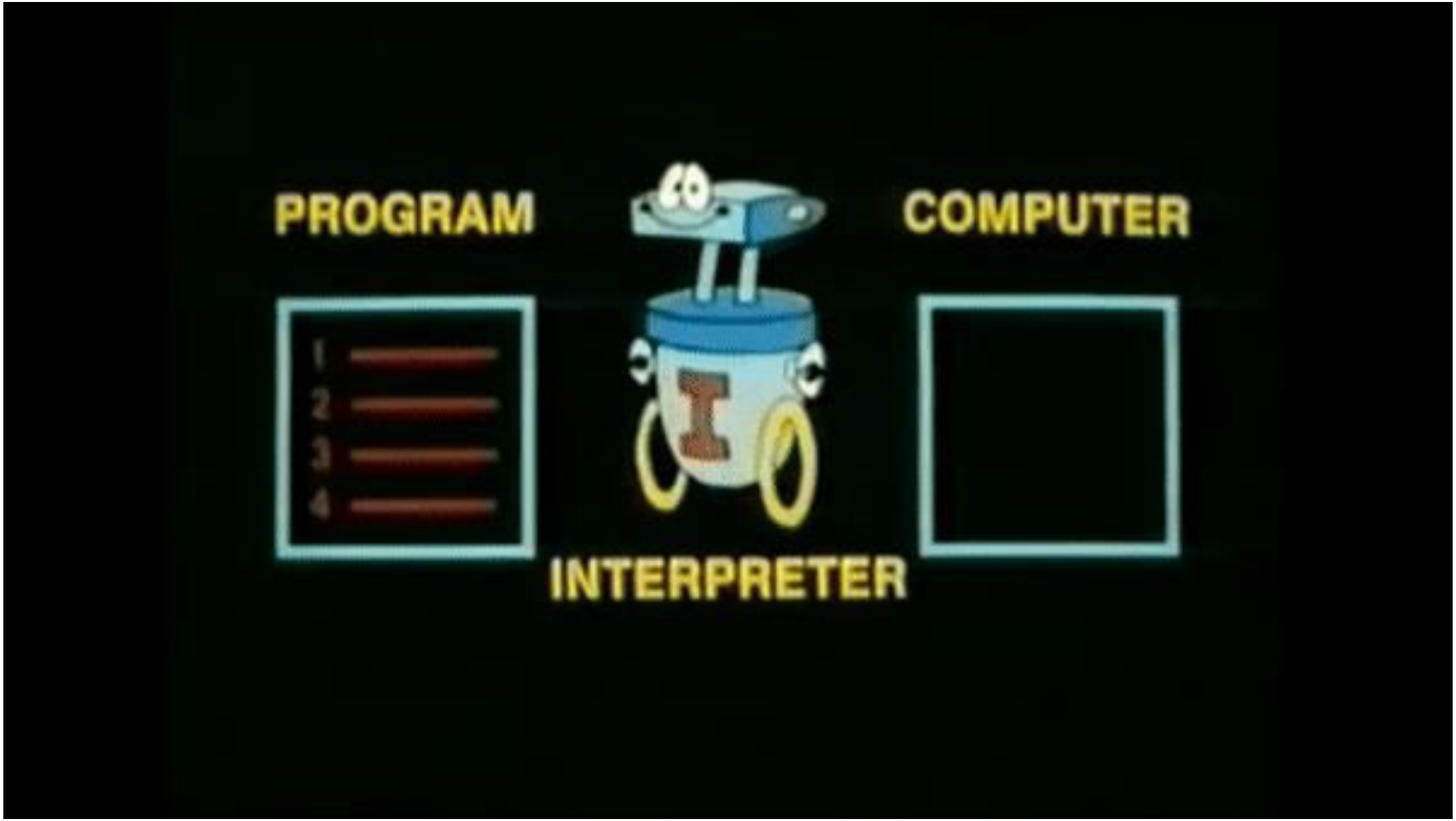



**INTERPRETER**



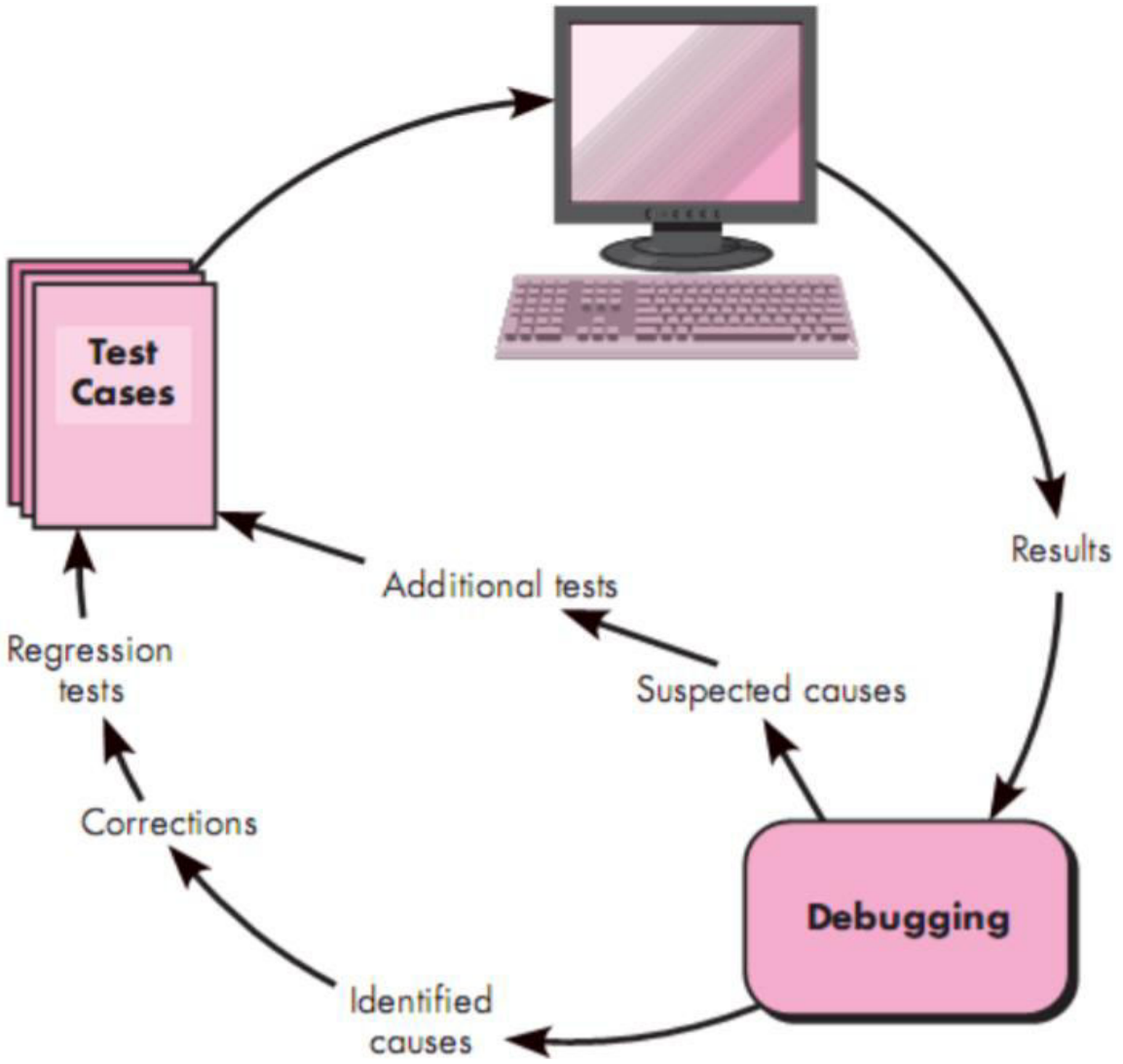

**COMPILER**

# Compiler & Interpreter



# Debugger

- A debugger is a computer program used by programmers to test and debug a target program.



# Compiler vs Debugger

| COMPILER | DEBUGGER |
| --- | --- |
| It is a computer program used to translate high-level language into set machine language. | It is a computer program used to test and debug target programs. |
| It generally allows computer to run understand program without need of programming software used to create it. | It generally allows you to uncover and diagnose errors in computer software. |
| It is very important to convert text that programmer writes into format that CPU understands. | It is very important to provide maximum useful information of data structures and allows easy interpretation. |
| It takes less time as compared to debugger. | It takes more time as fixing some errors may introduce others. |
| Compiled programs might have some errors or bugs. | Debugged program cannot have any errors. |

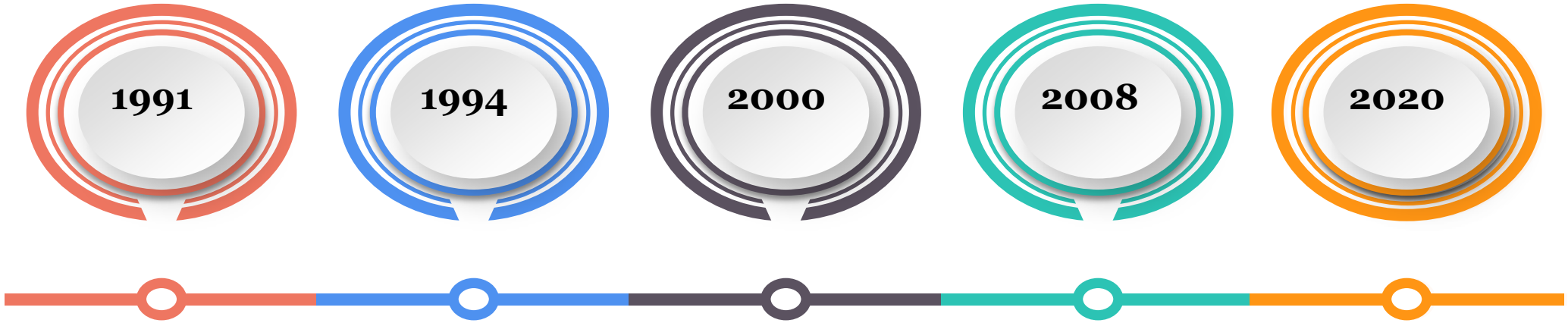
# Compiler vs Debugger

| COMPILER | DEBUGGER |
| --- | --- |
| It has capability to detect syntax Errors and compile time errors. | It provides more capabilities to detect errors in programs as compared to compiler. |
| It generates IL (Intermediate Language) code. | It checks IL code line by line. |
| It is more difficult task to design and develop a compiler. | It is less difficult to design and develop a debugger as compared to compiler. |
| It performs various tasks such as pre-processing, parsing, semantic analysis, lexical analysis, etc. | It performs various tasks such as check and change data contents, detect and remove existing potential errors, etc. |

# Compiler vs Interpreter

| COMPILER | INTERPRETER |
| --- | --- |
| Compiler scans the whole program in one go. | Translates program one statement at a time. |
| As it scans the code in one go, the errors (if any) are shown at the end together. | Considering it scans code one line at a time, errors are shown line by line. |
| Main advantage of compilers is, it's execution time. | Due to interpreters being slow in executing the object code, it is preferred less. |
| It converts the source code into object code. | It does not convert source code into object code instead it scans it line by line. |
| It does not require source code for later execution. | It requires source code for later execution. |
| C, C++, C# etc. | Python, Ruby, Perl, SNOBOL, MATLAB, etc. |

# History of Python



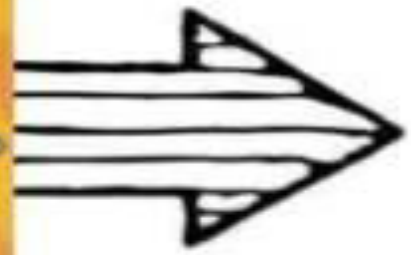

Van Rossum Publishes **version 0.9.0** to alt.sources

**Python 1.0**, including functional programming (lambda's, map, filter, reduce

**Python 2** introduces list comprehensions and garbage collection

**Python 3** fixes fundamental design flaws and is not backwards compatible.

**Python 2** is end of life, last version 2.7.18 released

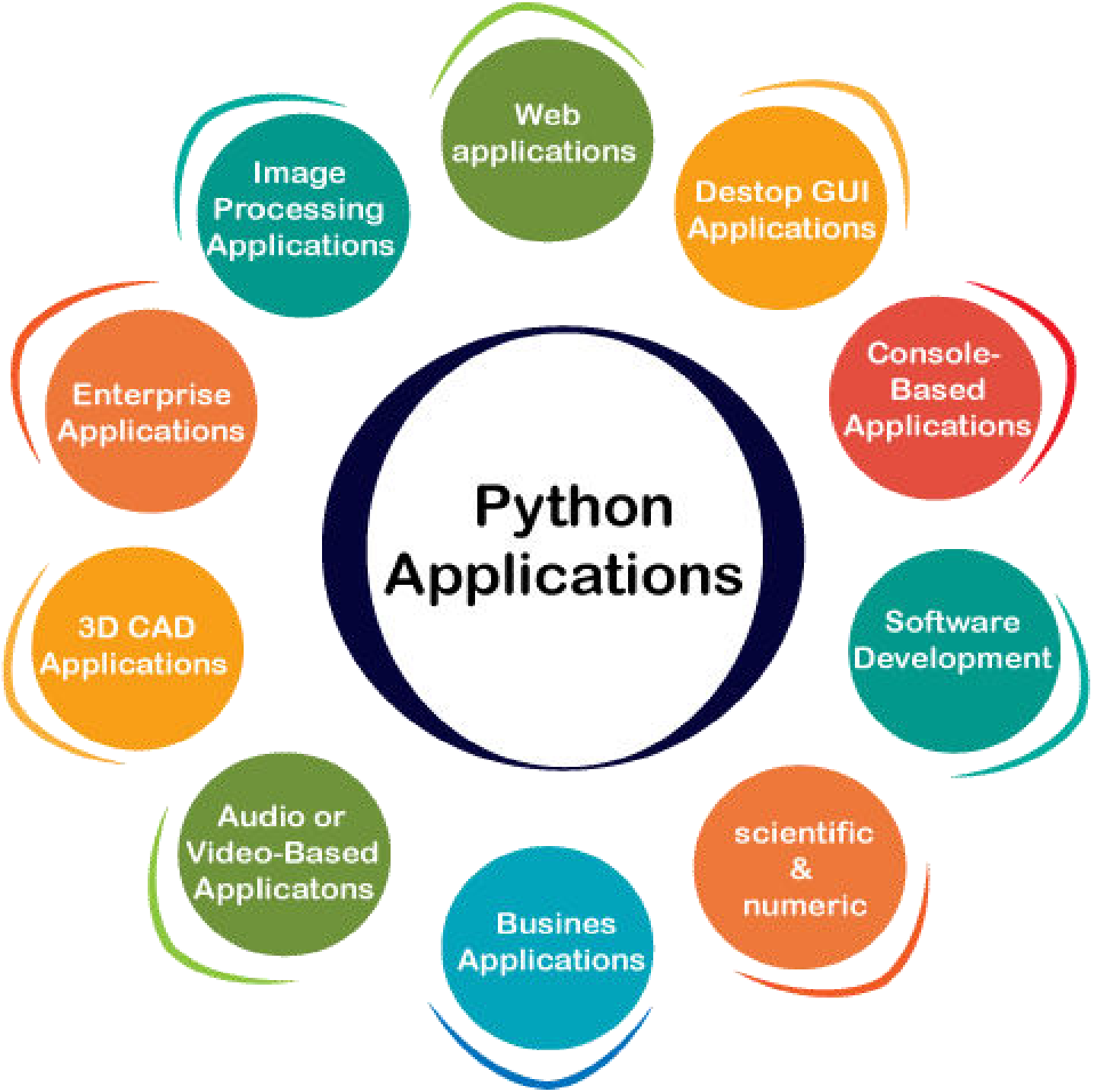




## Why is it called Python?

When he began implementing Python, Guido van Rossum was also reading the published scripts from "Monty Python's Flying Circus", a BBC comedy series from the 1970s. Van Rossum thought he needed a name that was short, unique, and slightly mysterious, so he decided to call the language Python.

# Features of Python

1. Easy
2. Expressive
3. Free and Open Source
4. High-Level
5. Portable
6. Object Oriented
7. Extensible
8. Embeddable
9. Interpreted
10. Large Standard Library
11. GUI Programming
12. Dynamically Typed

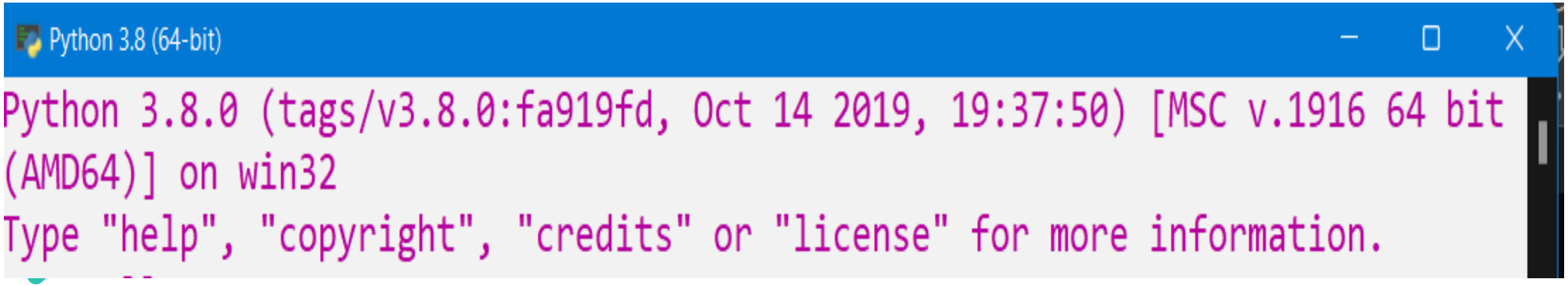

Python Applications
Web applications
Destop GUI Applications
Console-Based Applications
Software Development
scientific & numeric
Busines Applications
Audio or Video-Based Applicatons
3D CAD Applications
Enterprise Applications
Image Processing Applications

# Python Interpreter

- Python is considered an interpreted language because Python programs are executed by an interpreter.
- There are two ways to use the interpreter:
    i) interactive mode
    ii) script mode.

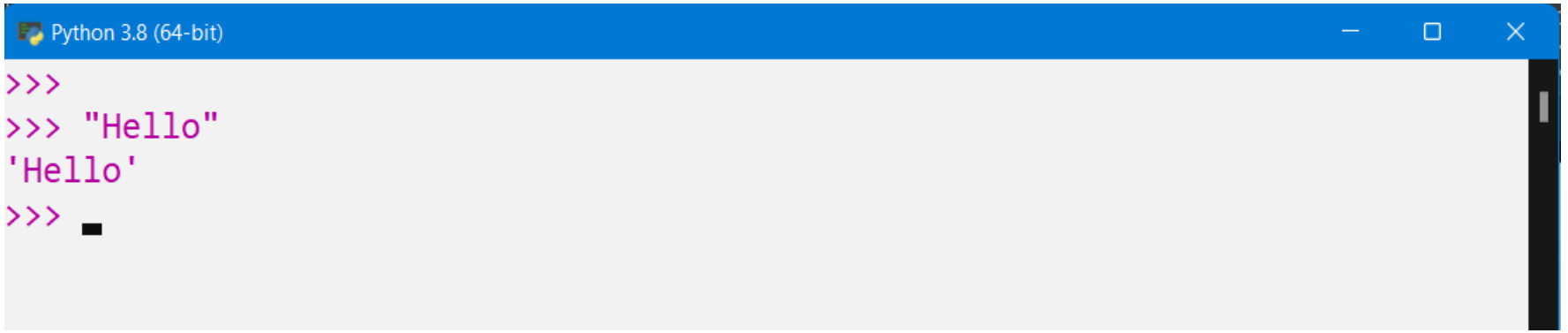
# Python Interactive Mode

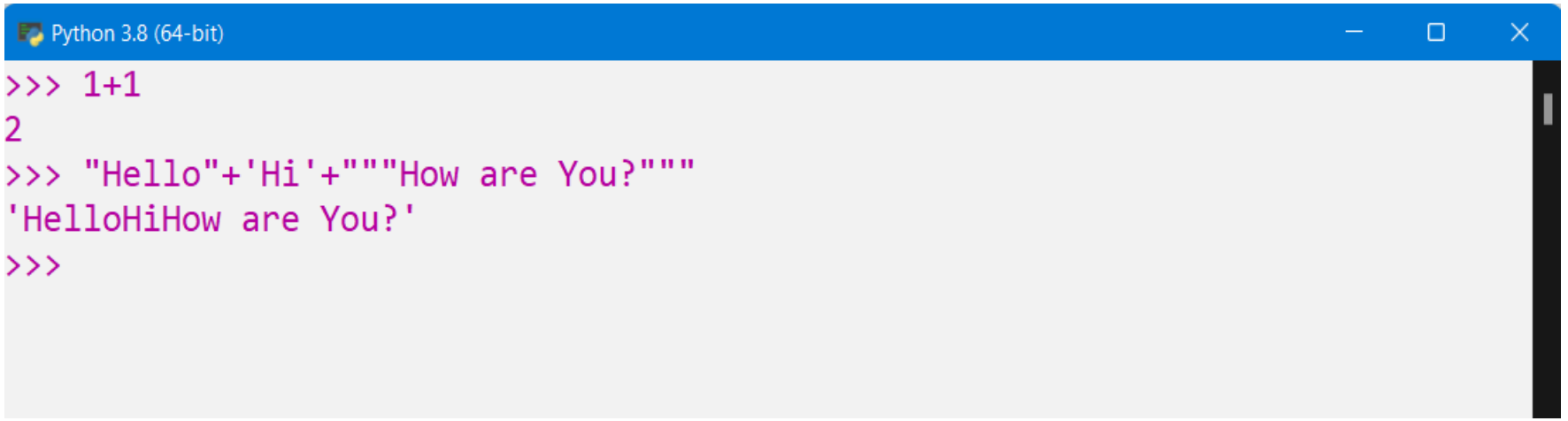
- In interactive mode, you type Python programs, and the interpreter displays the result.
- The interpreter prints a welcome message stating its version number and a copyright notice before printing the first prompt:



# Python Interactive Mode

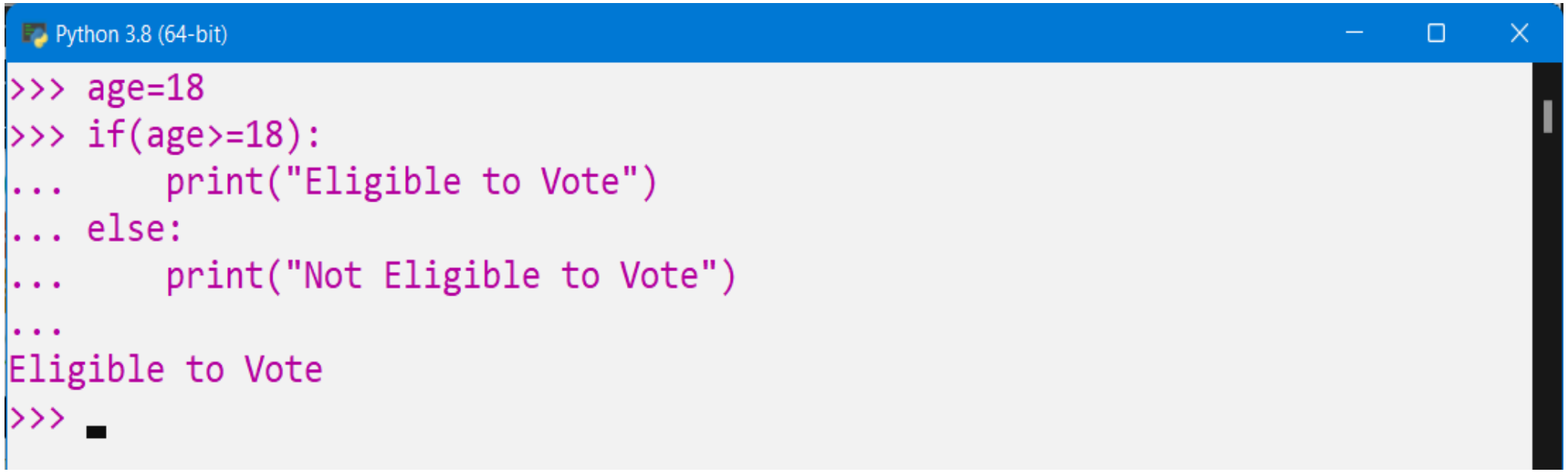
- In this mode it prompts for the next command with the primary prompt, usually three greater-than signs (>>>) (also known as **Chevron**)



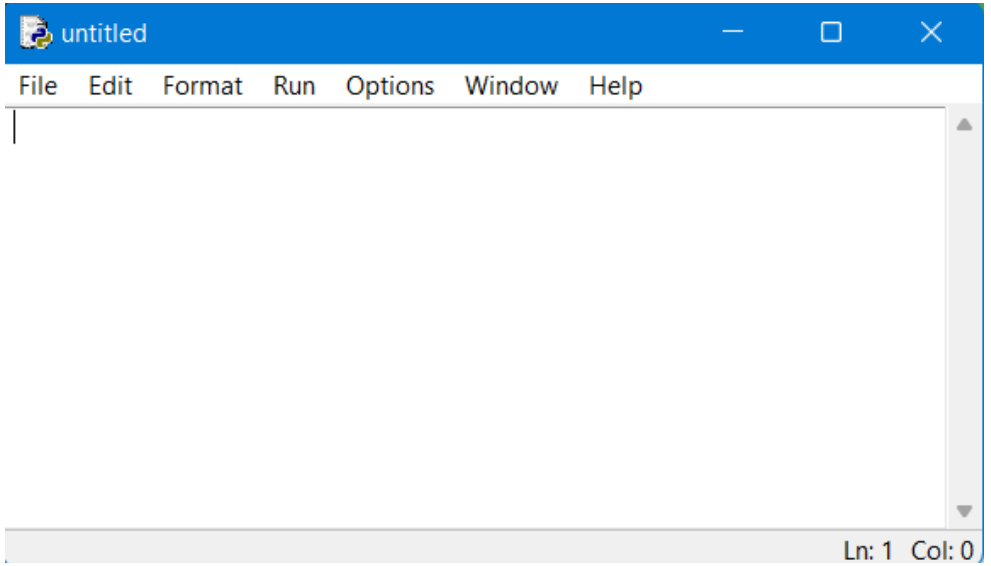
# Python Interactive Mode

- For continuation lines it prompts with the secondary prompt, by default three dots (...)

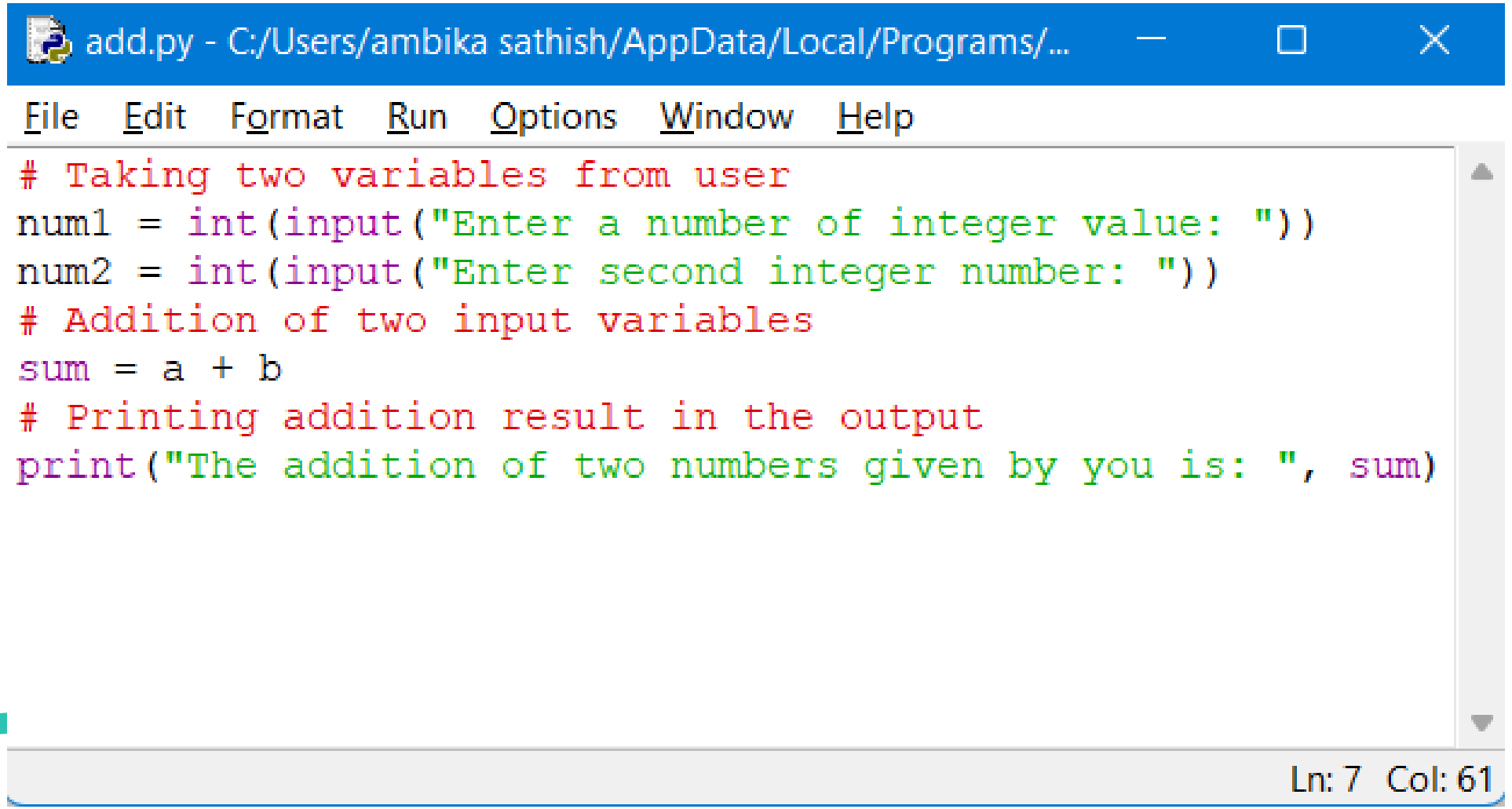


# Python Script Mode

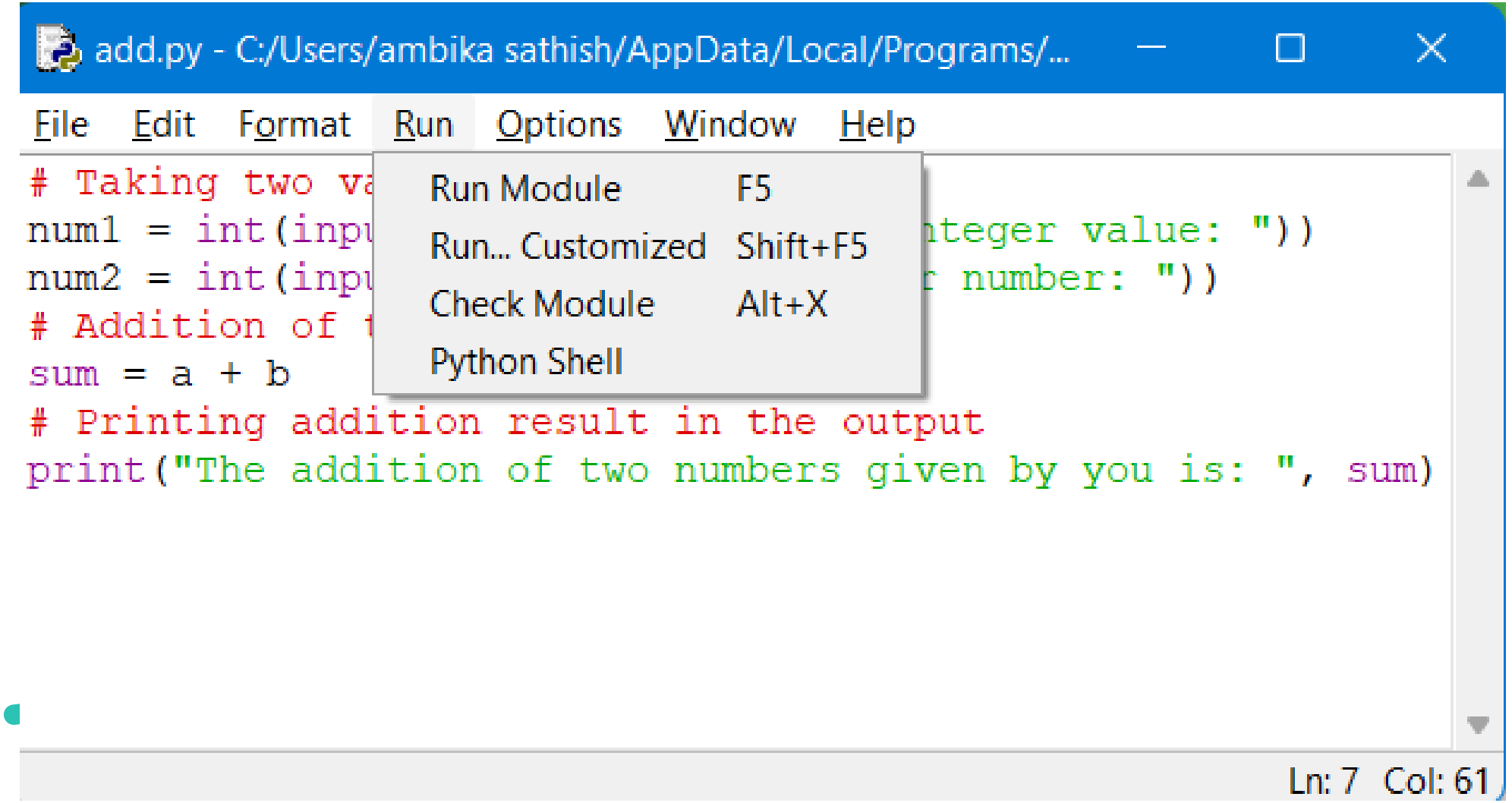
- First write a Python program inside a file (like a script) in the script mode, and then we execute the file after saving it in our system.
- We can execute the script of code either using the command prompt or using Python IDE installed in our system.



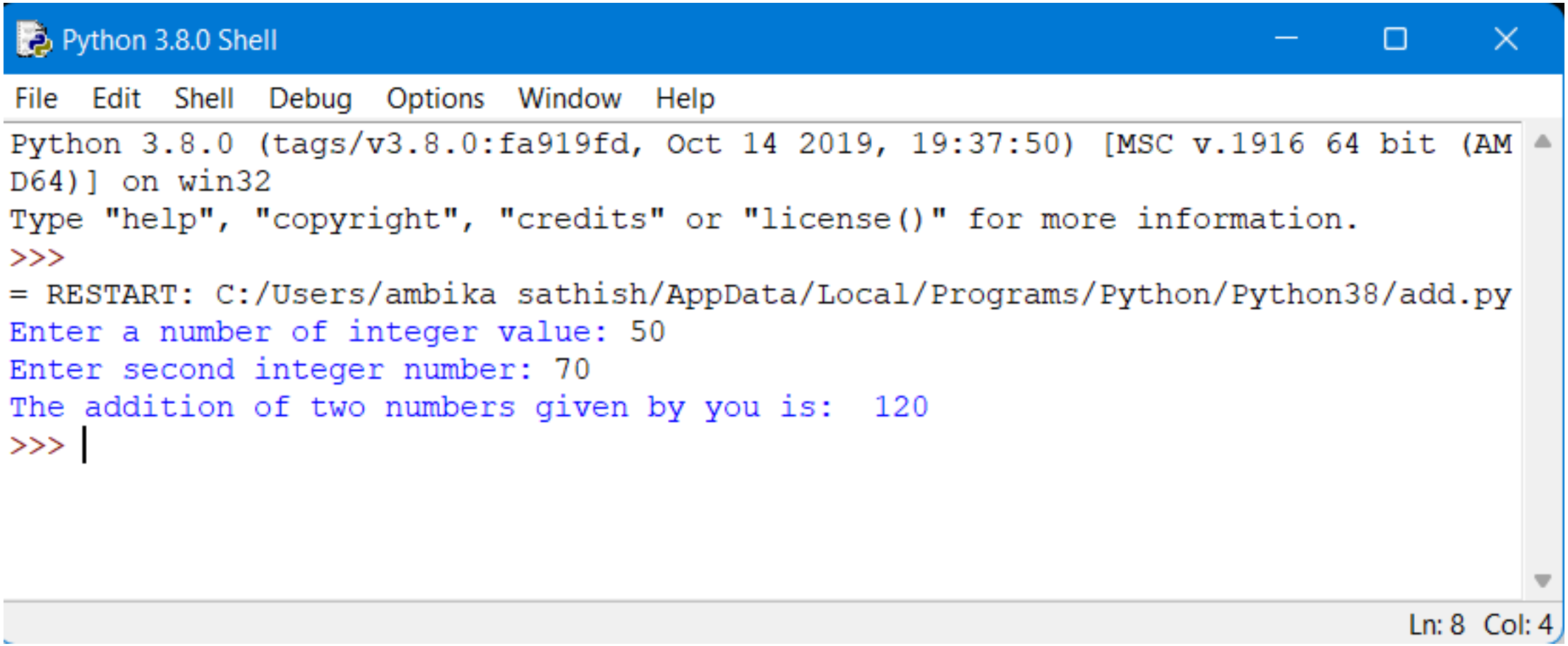
# Python Script Mode



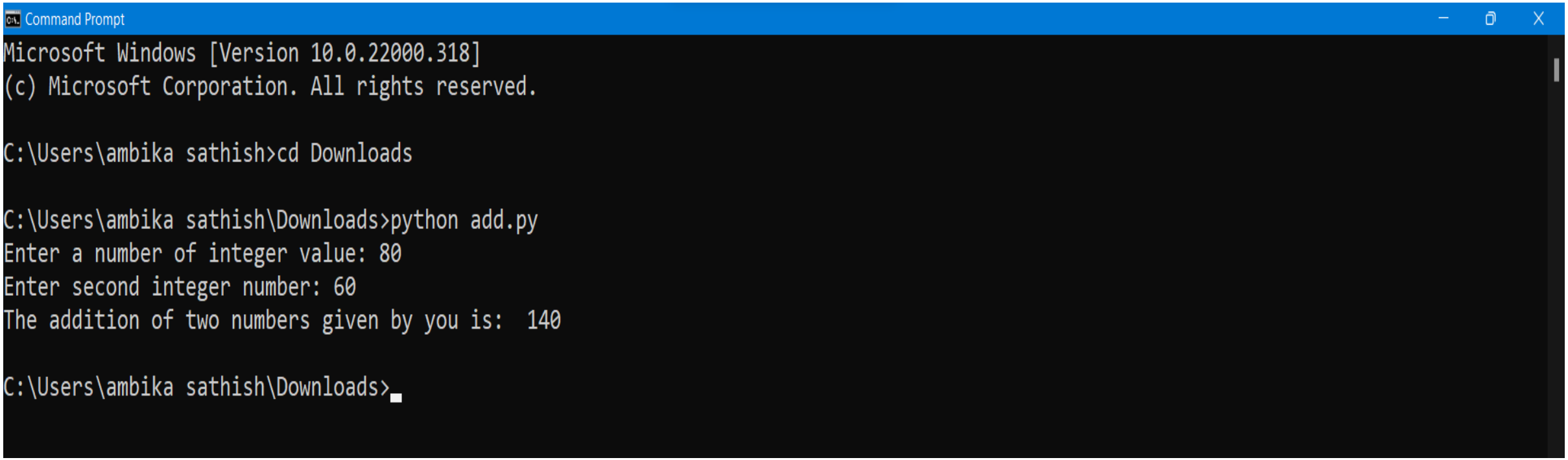
# Python Script Mode



# Python Script Mode



# Python Script Mode



# Python Script Mode vs Interactive Mode

| INTERACTIVE MODE | SCRIPT MODE |
|---|---|
| It is a way executing a python program in which statements are written in command prompt result is obtained on the same. | In the script mode, the python file is written in a file. Python interpreter reads the file and then executes it and provides the desired result. |
| The interactive mode is more suitable for writing very short programs | Script mode is more suitable for writing long programs. |
| Editing of a code is tedious task. | Editing of code can easily be done. |
| We get output for every single line of code. | The entire program is first interpreted and then executed. |
| Code cannot be saved and used for the future. | Code can be saved and used for the future. |
| It is most preferred by beginners. | It is most preferred by experts. |