

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.

??????

The image shows a screenshot of the Google Translate web interface. The source language is set to English and the target language is Tamil. The input text is 'computer science', which is translated to 'கணினி அறிவியல்' (Kaṇiṇi ariviyal) in Tamil. The interface includes a search bar with suggestions, a microphone icon, a speaker icon, and a 'Verified' badge. At the bottom, there are links for 'Open in Google Translate' and 'Feedback'.

English

Tamil

computer science

கணினி அறிவியல்
Kaṇiṇi ariviyal

computer science

computer science engineering

computer sciences

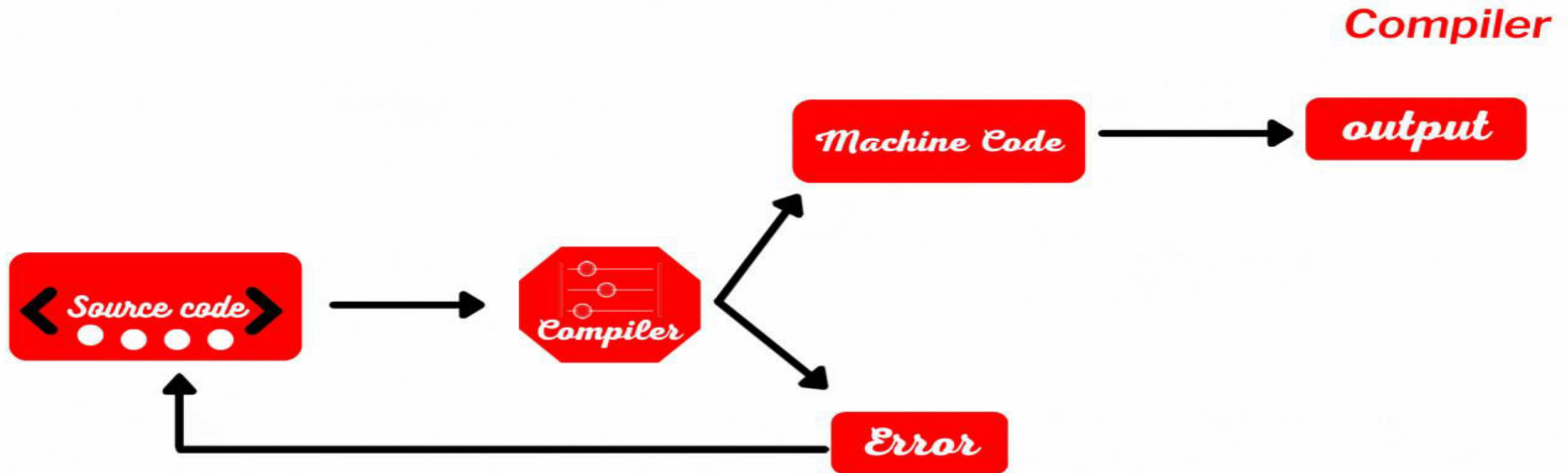
computer science and engineering

Verified

Open in Google Translate • Feedback

Compilers

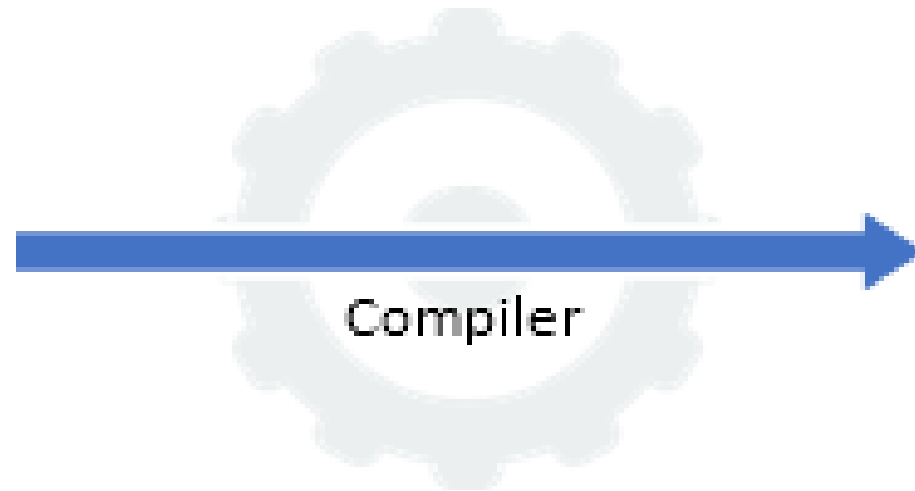
- A **compiler** is a program that translates source code into object code to be understood by a specific central processing unit (CPU).



Compilers

```
#include <stdio.h>

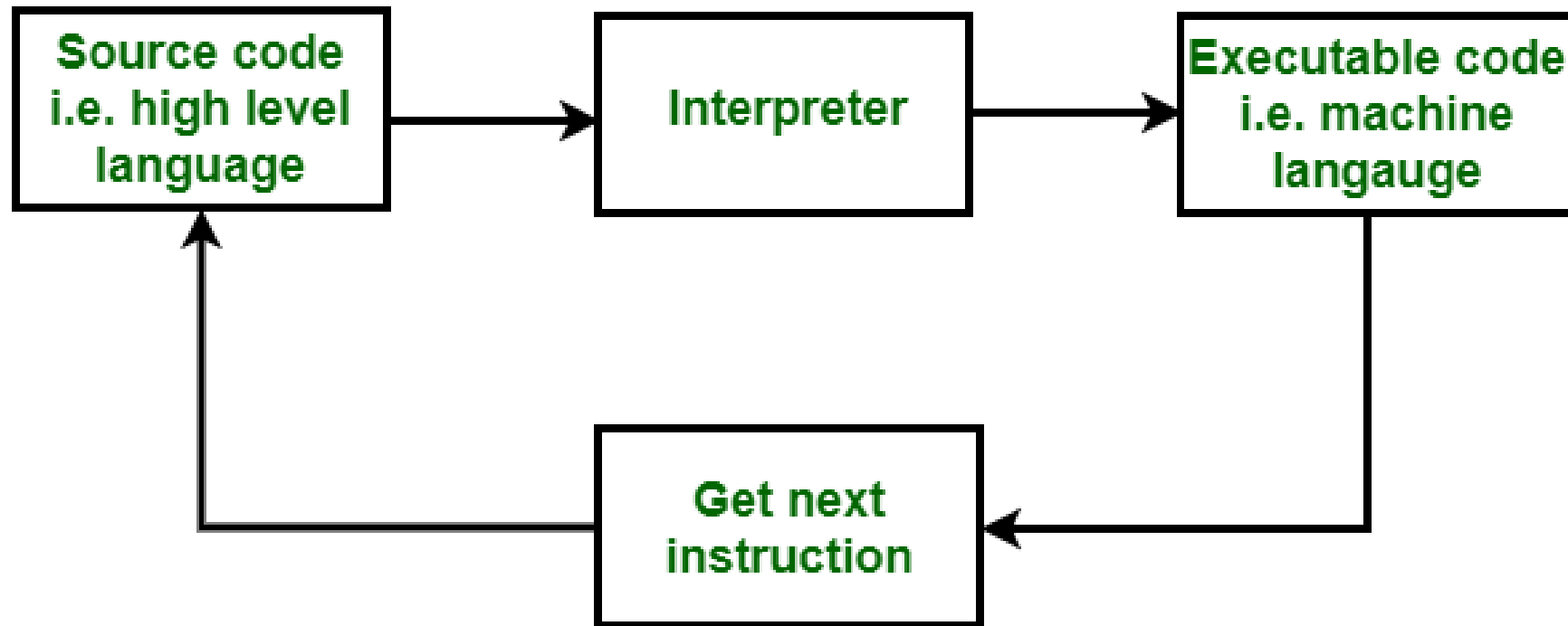
int main()
{
    printf(
        "Codeforwin");
    return 0;
}
```



```
1010101110001100100
1111000111100011000
1010100011100010100
1011011101001111111
1000101010111001010
1110101101010101010
1010110001000111011
1010100011101010011
0101010100001101110
1011110101101011101
000111111111100010
```

Interpreter

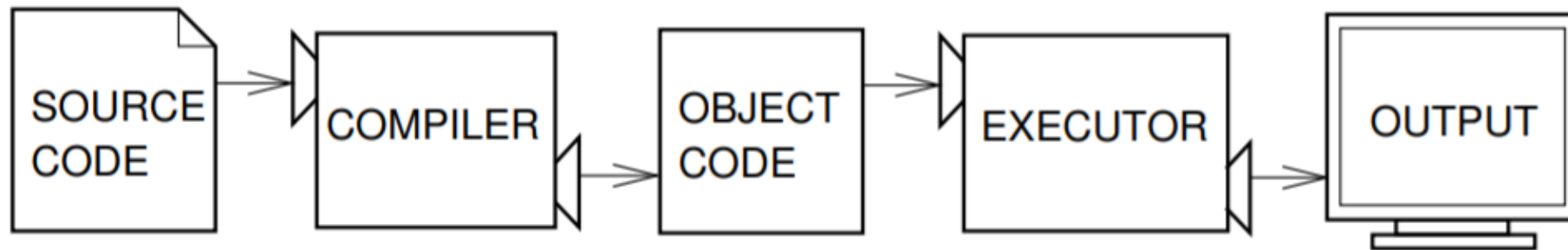
- An Interpreter directly executes instructions written in a programming or scripting language without previously converting them to an object code or machine code.



Compiler & Interpreter – Block Diagram



INTERPRETER



COMPILER

Compiler & Interpreter

PROGRAM



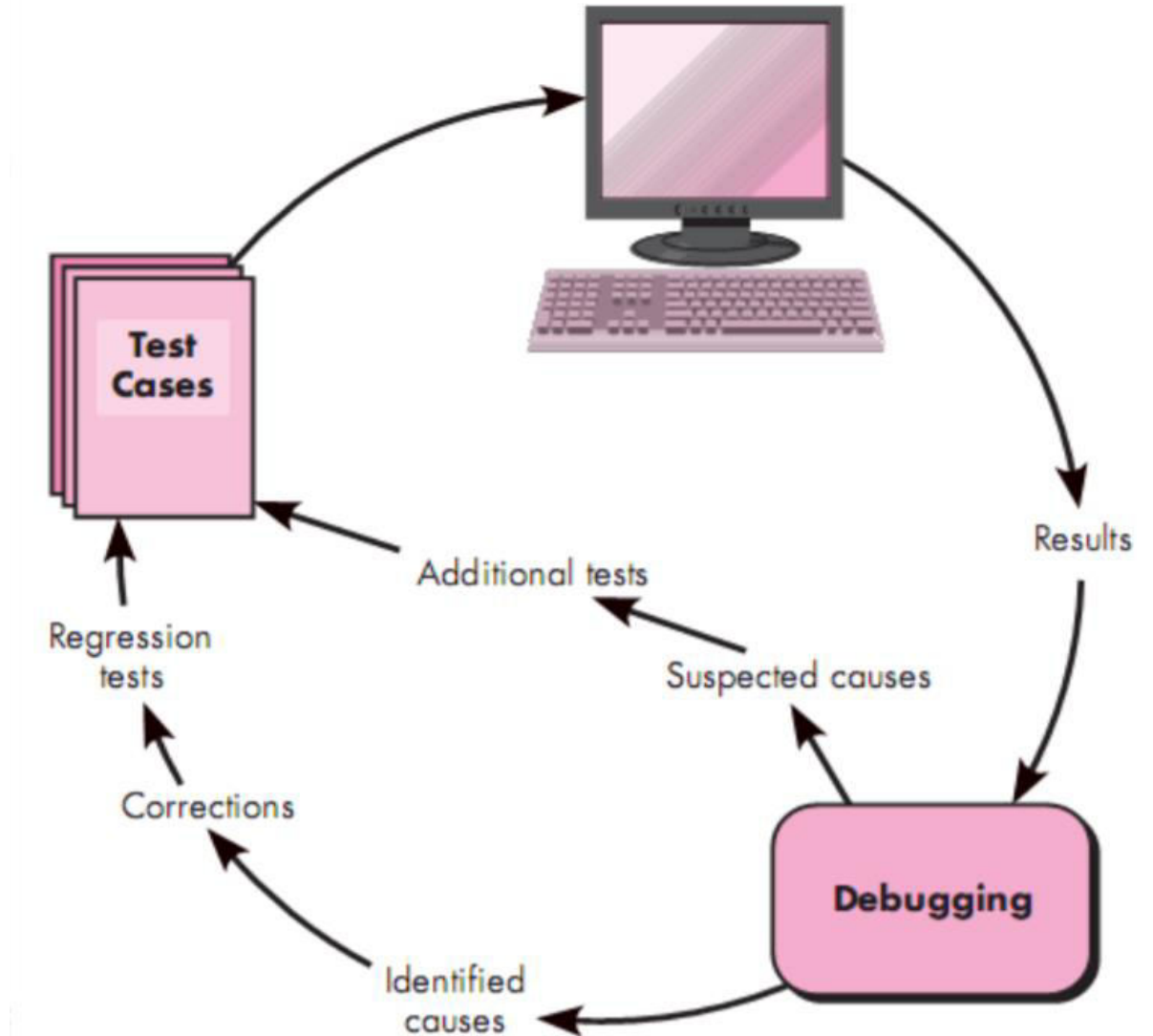
COMPUTER



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



1991

Van Rossum
Publishes
version 0.9.0
to alt.sources

1994

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

2000

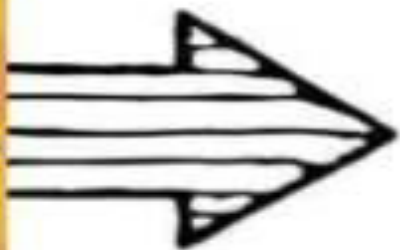
Python 2
introduces list
comprehensions
and garbage
collection

2008

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

2020

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.

Easy

01

Extensible

07

Expressive

02

Embeddable

08

Free and
Open Source

03

Interpreted

09

High-Level

04

Large Standard
Library

10

Portable

05

GUI
Programming

11

Object
Oriented

06

Dynamically
Typed

12

Features of



Python

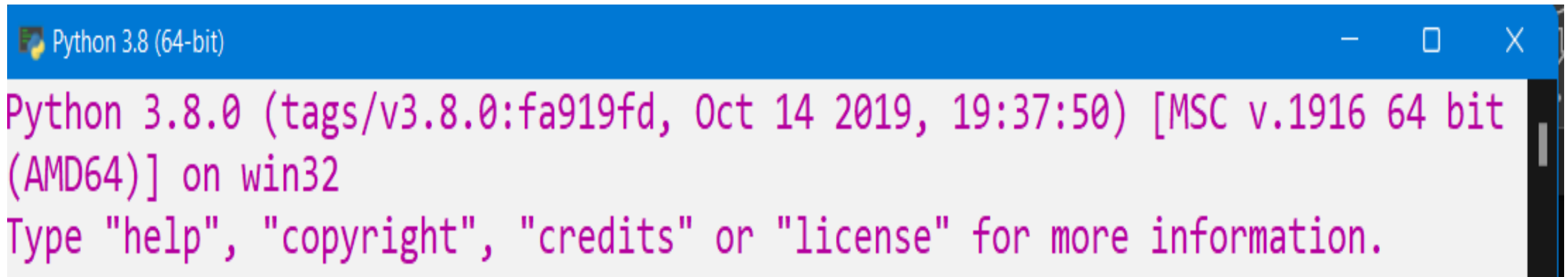


Python Interpreter

- 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:

A screenshot of a Windows command prompt window titled "Python 3.8 (64-bit)". The window contains the following text in purple font: "Python 3.8.0 (tags/v3.8.0:fa919fd, Oct 14 2019, 19:37:50) [MSC v.1916 64 bit (AMD64)] on win32" followed by "Type 'help', 'copyright', 'credits' or 'license' for more information." on the next line.

```
Python 3.8 (64-bit)
Python 3.8.0 (tags/v3.8.0:fa919fd, Oct 14 2019, 19:37:50) [MSC v.1916 64 bit
(AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
```

Python Interactive Mode

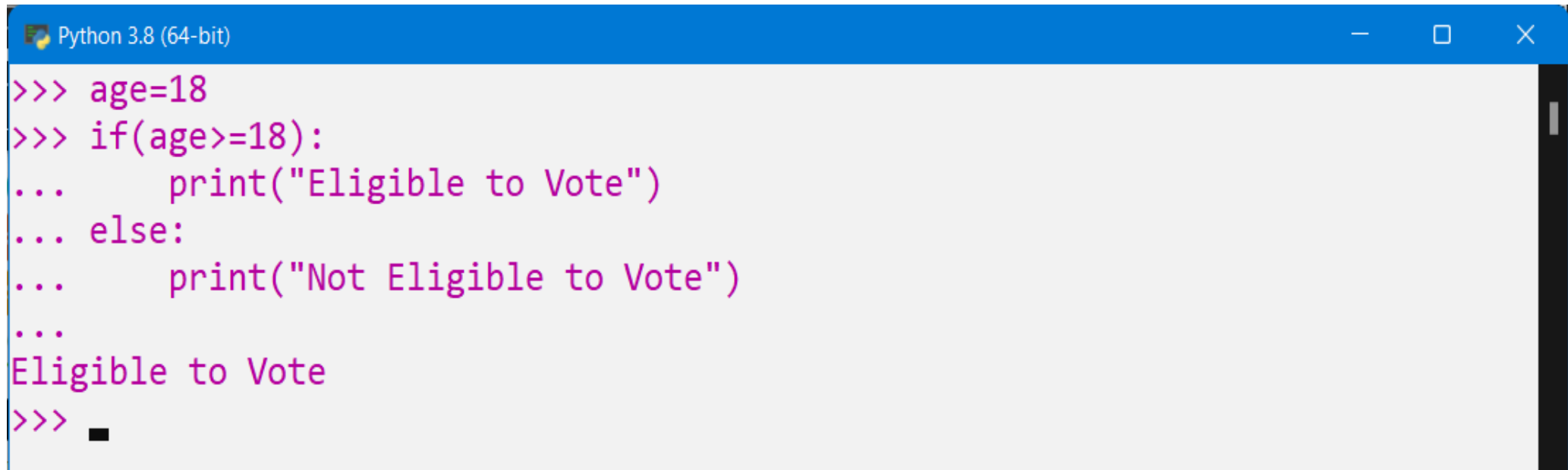
- In this mode it prompts for the next command with the primary prompt, usually three greater-than signs (`>>>`) (also known as **Chevron**)

```
Python 3.8 (64-bit)
>>>
>>> "Hello"
'Hello'
>>> █
```

```
Python 3.8 (64-bit)
>>> 1+1
2
>>> "Hello"+"Hi"+"How are You?"
'HelloHiHow are You?'
>>>
```

Python Interactive Mode

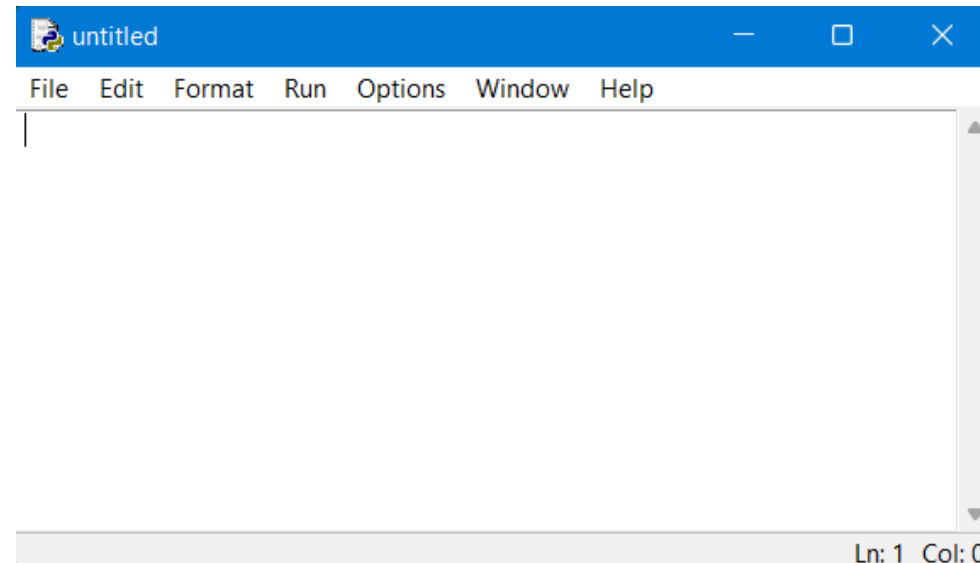
- For continuation lines it prompts with the secondary prompt, by default three dots (...)



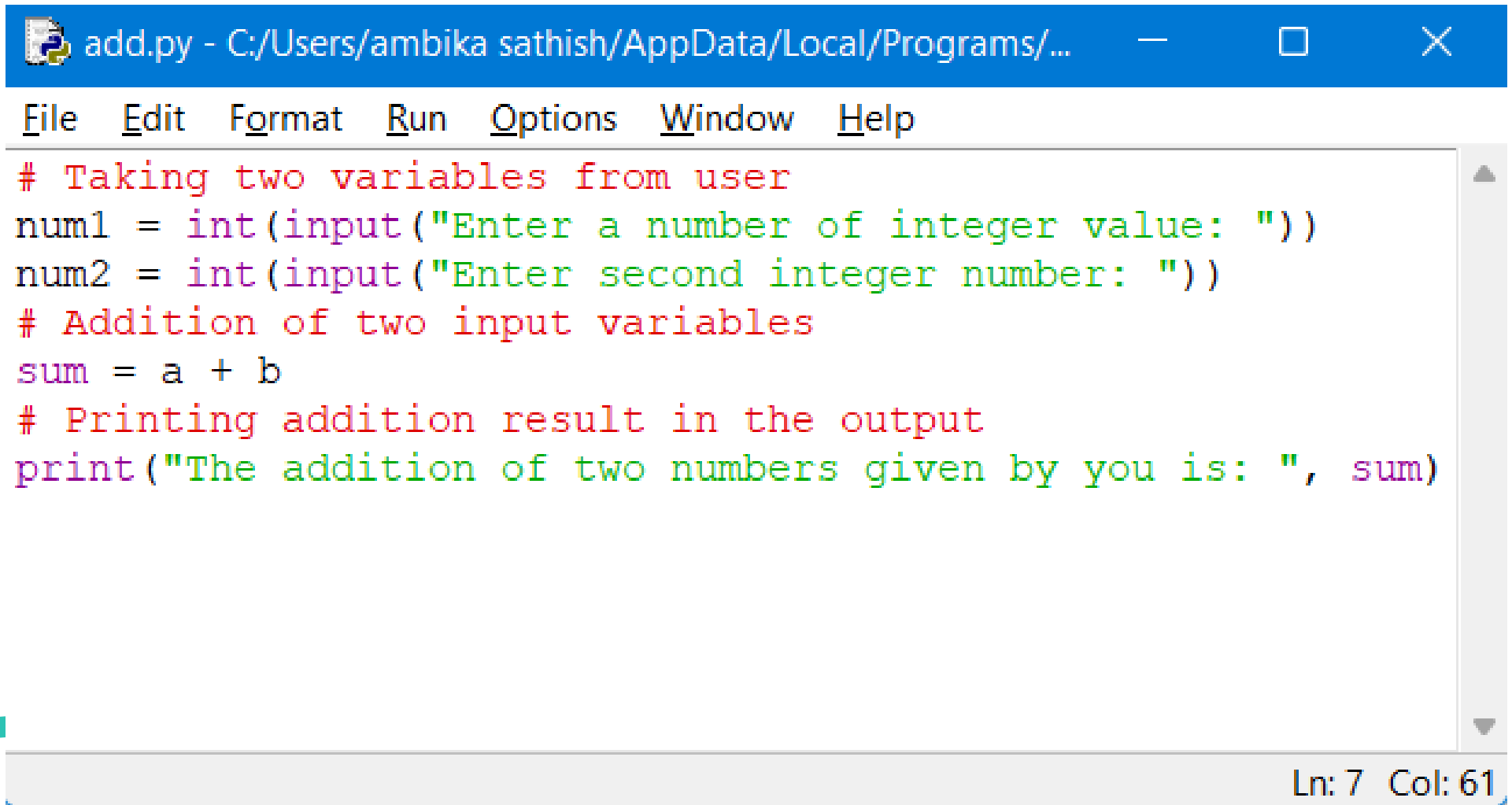
```
Python 3.8 (64-bit)
>>> age=18
>>> if(age>=18):
...     print("Eligible to Vote")
... else:
...     print("Not Eligible to Vote")
...
Eligible to Vote
>>> █
```

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

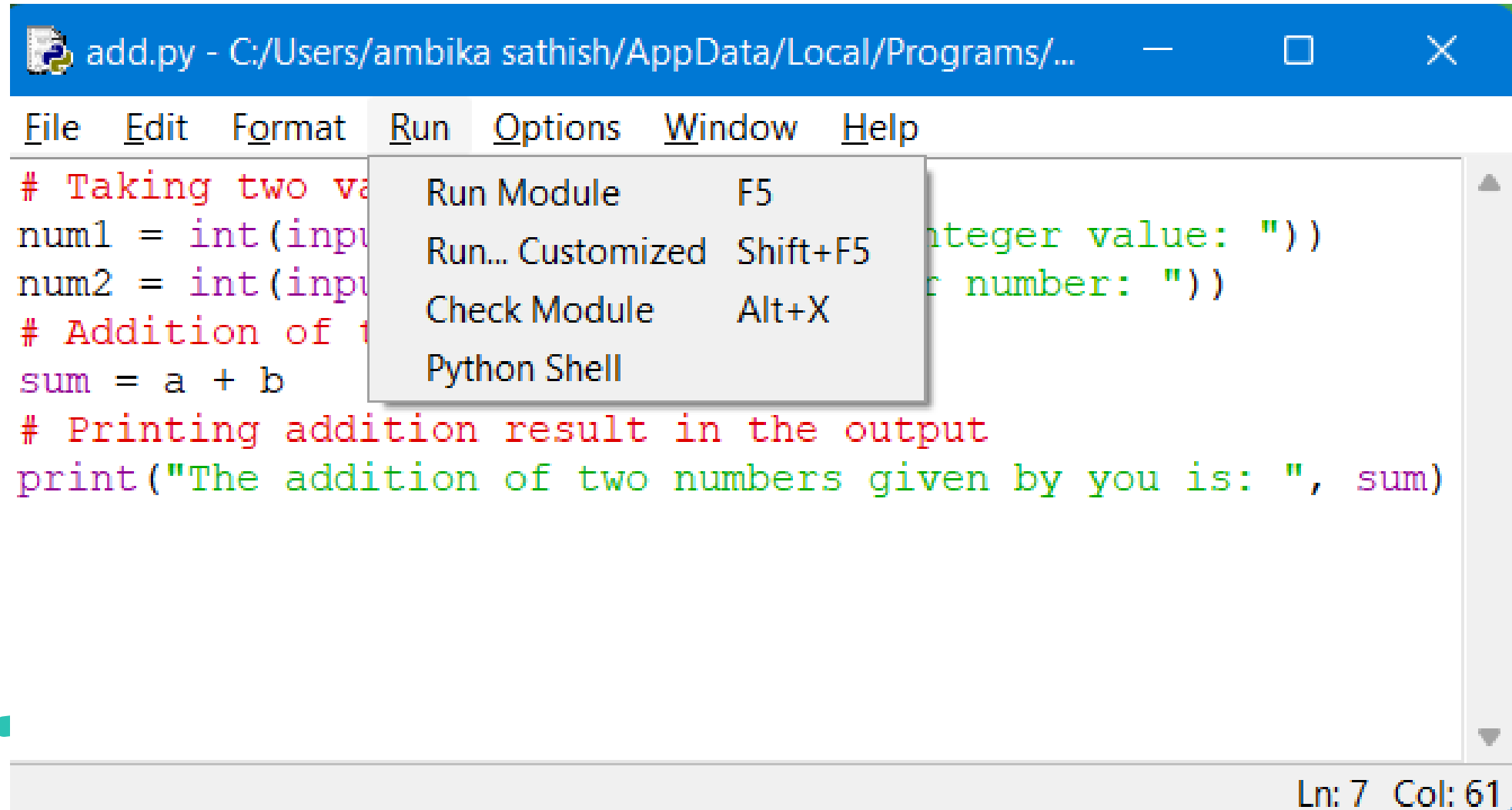


The image shows a screenshot of a Python script editor window. The title bar reads "add.py - C:/Users/ambika sathish/AppData/Local/Programs/...". The menu bar includes "File", "Edit", "Format", "Run", "Options", "Window", and "Help". The script content is as follows:

```
# Taking two variables from user
num1 = int(input("Enter a number of integer value: "))
num2 = int(input("Enter second integer number: "))
# Addition of two input variables
sum = a + b
# Printing addition result in the output
print("The addition of two numbers given by you is: ", sum)
```

The status bar at the bottom right indicates "Ln: 7 Col: 61".

Python Script Mode

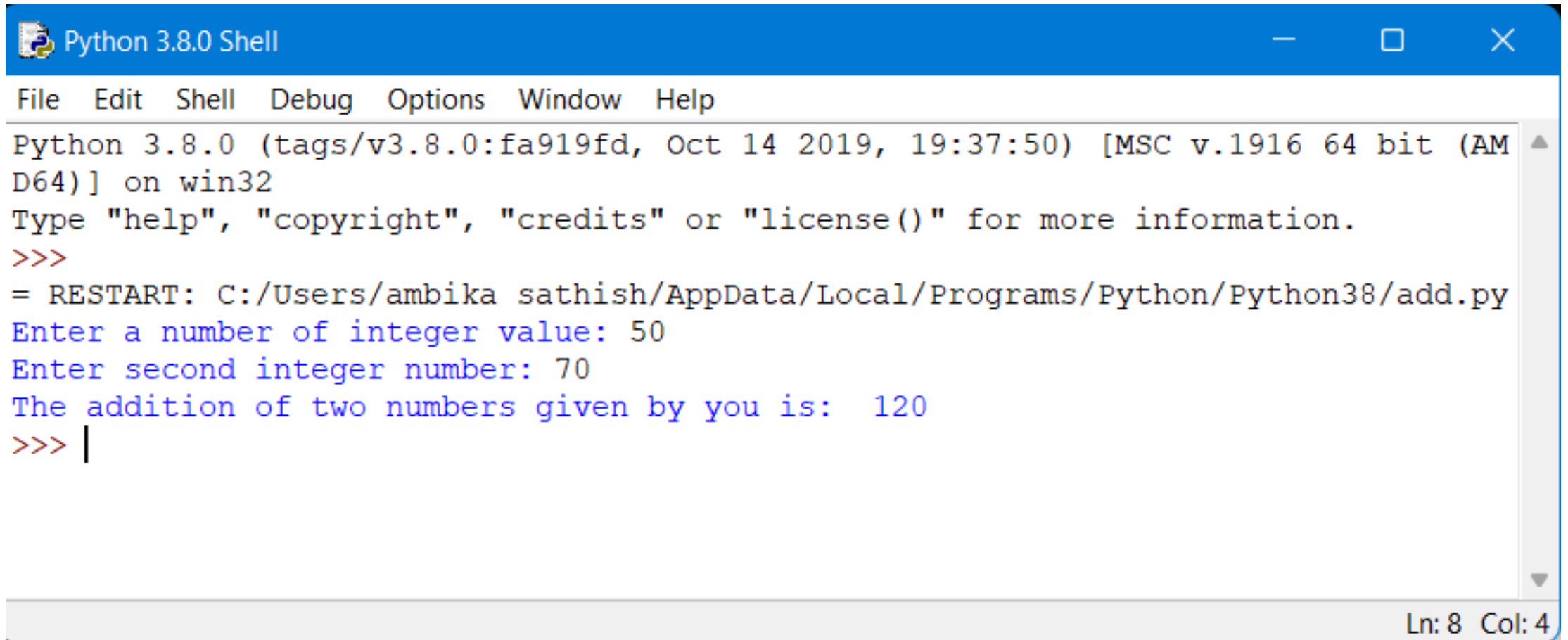


The image shows a screenshot of a Python IDE window titled "add.py - C:/Users/ambika sathish/AppData/Local/Programs/...". The window has a menu bar with "File", "Edit", "Format", "Run", "Options", "Window", and "Help". The "Run" menu is open, showing options: "Run Module" (F5), "Run... Customized" (Shift+F5), "Check Module" (Alt+X), and "Python Shell". The main text area contains Python code for adding two numbers. The status bar at the bottom right shows "Ln: 7 Col: 61".

```
# Taking two values from user and converting them into integer value: ")
num1 = int(input("Enter the first number: "))
num2 = int(input("Enter the second number: "))
# Addition of two numbers
sum = a + b
# Printing addition result in the output
print("The addition of two numbers given by you is: ", sum)
```

Ln: 7 Col: 61

Python Script Mode



```
Python 3.8.0 Shell
File Edit Shell Debug Options Window Help
Python 3.8.0 (tags/v3.8.0:fa919fd, Oct 14 2019, 19:37:50) [MSC v.1916 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:/Users/ambika sathish/AppData/Local/Programs/Python/Python38/add.py
Enter a number of integer value: 50
Enter second integer number: 70
The addition of two numbers given by you is: 120
>>> |
```

Ln: 8 Col: 4

Python Script Mode

```
Command Prompt
Microsoft Windows [Version 10.0.22000.318]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ambika sathish>cd Downloads

C:\Users\ambika sathish\Downloads>python add.py
Enter a number of integer value: 80
Enter second integer number: 60
The addition of two numbers given by you is: 140

C:\Users\ambika sathish\Downloads>
```

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.