

# Introduction to Python Programming



## Learning Objectives

By the end of this lesson, you will be able to:

- 🕒 Learn about the history of Python
- 🕒 Explore advantages of using Python
- 🕒 Install Python and identify its IDE
- 🕒 Explore how to use Jupyter notebook
- 🕒 Execute a Python program
- 🕒 Implement Python identifiers, indentation, and comments



## **Business Scenario**

ABC Inc. is planning to explore and work on artificial intelligence projects. The organization is currently struggling to choose the right programming language for their projects and to keep functionality, scalability, and efficiency as priority factors to be maintained along with a better developer experience.

Python is chosen as the programming language for all prospective projects because it is simple, secure, scalable, and rich in built-in libraries.

In this lesson, we will explore the following:

- What is Python and its advantages
- Installation of Python
- Python identifiers, indentations, and comments
- Execution of Python programs



The background features several abstract geometric shapes. A large blue shape is in the top-left corner. A light blue shape is in the top-middle. Another light blue shape is in the top-right. A light blue shape is in the bottom-left. A light blue shape is in the bottom-middle.

# Introduction to Python



**Discussion**

# Python



- Is Python a programming language or a scripting language?
- What is Python, and why was it introduced when there were other languages?
- What are its benefits over other languages?

## Python: History

Python is a widely-used programming language that was conceived in the late 1980s.



Python was invented by Guido Van Rossum (CWI, Amsterdam).

It is named after the BBC comedy series "Monty Python's Flying Circus".

It is now maintained by the Python Software Foundation (PSF).

It is derived from ABC, Modula-3, Lisp, and "C" languages.

## Python: Definition



- Python is a high-level, interpreter based, object-oriented programming language with dynamic semantics.
- It is a simple, general-purpose programming language and can be used for various applications, such as data science and automation.
- Python's simple and easy-to-learn syntax emphasizes readability and reduces the cost of program maintenance.
- Python supports modules and packages, which encourages program modularity and code reuse.
- Python is a free and open-source language.



## Python: Advantages

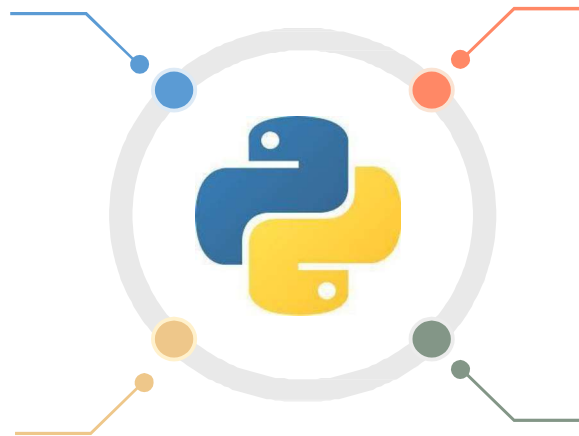
The advantages of Python are:

### **Flexible**

It aids in the cross-platform compatibility and scripting of web pages and applications.

### **Readability and maintenance**

Python places a strong emphasis on readable code and permits the use of English keywords in place of punctuation.



### **Easy to learn and use**

It uses a minimal amount of code to complete tasks.

### **Robust standard library**

It allows selecting a module from a large selection based on the requirement.

## Python: Technical Strengths

Python has the following strengths which make it user-friendly:

Object-oriented programming	Supports advanced notions, such as polymorphism, operator overloading, and multiple inheritances
Free and open-source	<ul style="list-style-type: none"><li>• Allows modification, and redistribution of the source code</li><li>• Provides free license</li></ul>
Portable	<ul style="list-style-type: none"><li>• Can be implemented on every major platform</li><li>• Can be used with Unix, Linux, MS-DOS, MS Windows, Macintosh, and IBM</li></ul>
Powerful	<ul style="list-style-type: none"><li>• Provides dynamic typing and automatic memory management</li><li>• Provides built-in objects and tools that consist of library and third-party utilities</li></ul>
Compatible	<ul style="list-style-type: none"><li>• Can be easily "glued" to components written in other languages</li><li>• Allows adding functionality to existing systems</li></ul>

## Python: Industrial Use Cases

Python is widely used in the following platforms:



### **YouTube**

Python is primarily used to construct the well-known YouTube video-sharing system.



### **Google**

Python is being extensively used in Google's web search system.



### **DropBox**

The server and client's software of DropBox is primarily coded in Python.

## Python: Industrial Use Cases

Python is widely used in the following platforms:



### **BitTorrent**

The peer-to-peer file-sharing system started off as a Python program.



### **NASA**

Python is being used at NASA for specific programming tasks.



### **Netflix**

Python is used through the "full content life cycle," at Netflix.

# Python



- Is Python a programming language or a scripting language?

Answer: Python is a programming language.

- What is Python, and why was it introduced when there were other languages?

Answer: Python is a widely-used programming language that was conceived in the late 1980s. Python is a portable, free, open-source, powerful, and compatible language, which makes it better than other programming languages.

- What are its benefits over other languages?

Answer: Python is flexible, easy to use, has better readability and maintenance, and has a robust standard library.



# Python Installation



**Discussion**

## Python

You are a data scientist and are supposed to teach the trainees to install Python in everyone's system. However, a few of them are facing issues with the installation. You need to guide the team to install Python using both methods.

The trainees must install Python in any one of the two methods and share the output after installation.



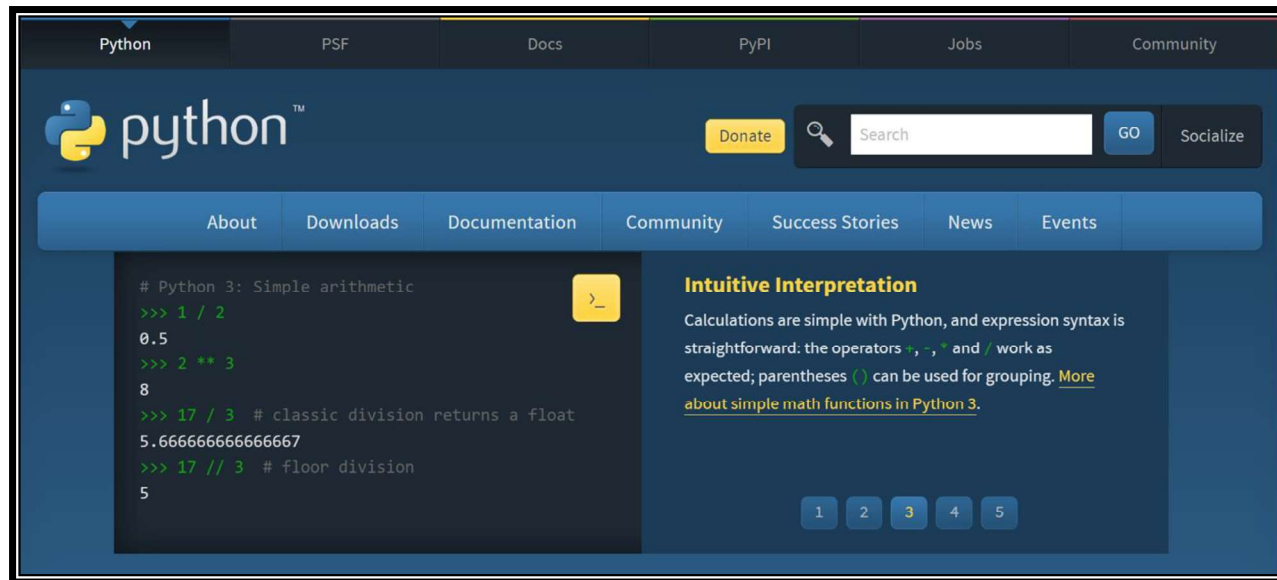


# Python: Installation

There are two ways to install Python:

## 1. Install Python using the URL:

**Step 1.1:** The latest or required version of Python for a specific platform can be installed from the official Python website: <https://www.python.org/>



# Python: Installation

There are two ways to install Python:

**Step 1.2:** Click on the *Downloads* to download Python:



# Python: Installation

There are two ways to install Python:

## 2. Install Python from the anaconda file distribution system

**Step 2.1:** Click on the link: <https://www.anaconda.com/products/distribution>

The screenshot shows the Anaconda website's product distribution page. The navigation bar includes links for Products, Pricing, Solutions, Resources, Partners, Blog, and Company, along with a Contact Sales button. A dropdown menu for 'Products' is open, listing several options: Anaconda Distribution (Open-source repository & toolkit), Anaconda Professional (Commercial-grade distribution), Anaconda Business (Cloud repository governance), Anaconda Server (On-prem repository governance), and Enterprise DS Platform (OSS code development platform). A red box labeled 'Specific platform' points to the 'Anaconda Distribution' option in the dropdown. To the right, a large card for 'Anaconda Distribution' features a green 'Download' button with an Apple logo, which is circled in grey. A red box labeled 'Recommended' points to this button. Below the button, it specifies 'Python 3.9 • 64-Bit Graphical Installer • 591 MB' and provides links to 'Get Additional Installers' for Windows, macOS, and Linux.

# Python: Installation

There are two ways to install Python:

**Step2.2:** Anaconda file distribution system consists of all the different installers; click on the required installer

The image shows the Anaconda website interface. On the left, the 'Products' dropdown menu is open, listing several options: 'Anaconda Distribution' (Open-source repository & toolkit), 'Anaconda Professional' (Commercial-grade distribution), 'Anaconda Business' (Cloud repository governance), 'Anaconda Server' (On-prem repository governance), and 'Enterprise DS Platform' (OSS code development platform). The 'Anaconda Distribution' option is circled in grey. An arrow points from this option to a separate page titled 'Anaconda Installers'. This page is divided into three columns for 'Windows', 'MacOS', and 'Linux'. Each column lists available Python versions (all are Python 3.9) and the corresponding installer types and sizes.

Windows	MacOS	Linux
Python 3.9 64-Bit Graphical Installer (594 MB) 32-Bit Graphical Installer (488 MB)	Python 3.9 64-Bit Graphical Installer (591 MB) 64-Bit Command Line Installer (584 MB) 64-Bit (M1) Graphical Installer (316 MB) 64-Bit (M1) Command Line Installer (305 MB)	Python 3.9 64-Bit (x86) Installer (659 MB) 64-Bit (Power8 and Power9) Installer (367 MB) 64-Bit (AWS Graviton2 / ARM64) Installer (568 MB) 64-bit (Linux on IBM Z & LinuxONE) Installer (280 MB)

## Assisted Practice: Installation of Python



**Duration: 5 mins**

**Objective:** In this demonstration, we will learn how to install Python.

### **Tasks to perform:**

1. Log in to the URL to download python: <https://www.python.org/>
2. Click on the *Downloads* to download Python



**Python IDE**



**Discussion**

# Python

Duration: 20 minutes

Why does every programming language have an IDE?

- What is an IDE?
- Is Jupyter notebook an IDE?





## Python: IDE

An integrated development environment (IDE) is a software suite that consolidates basic tools required to write and test software.

Python has the many IDEs:

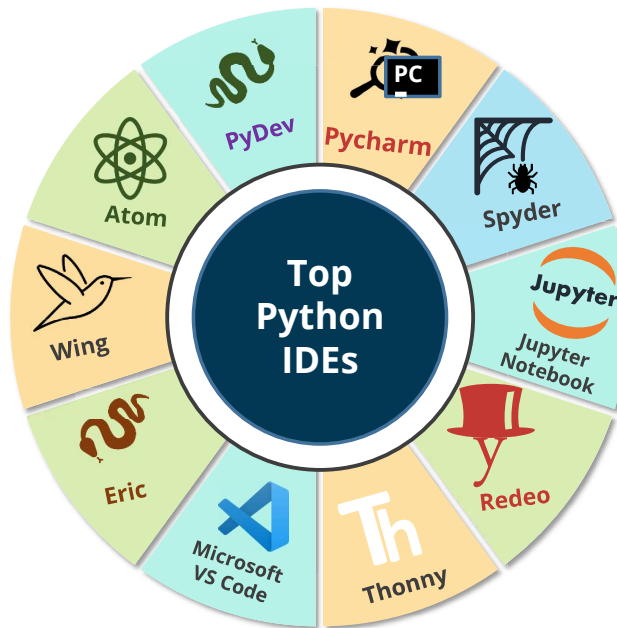


Image source: <https://www.javatpoint.com/python-ides>



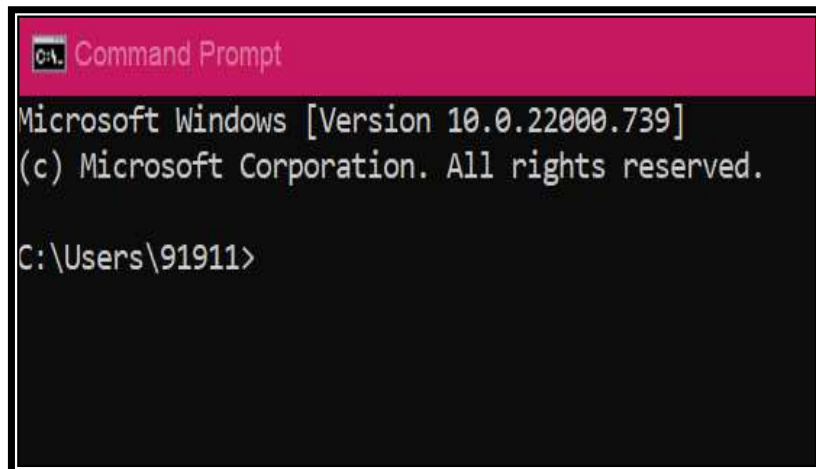
## Python: Interpreter

- Python code can be written in any text editor and saved using the “.py” extension in the system.
- Python is characterized as a REPL (Read-Eval-Print Loop) language because of the way its interpreter works:
  - Reads the command
  - Executes the command
  - Outputs the results
  - Then, loops back to read it again (read, evaluate, print, loop)

## Python: Shell

Python can be accessed through the command prompt on the Windows OS and the terminal window on the Mac OS.

Windows

A screenshot of the Windows Command Prompt. The title bar is pink and says "Command Prompt". The text inside shows the Microsoft Windows version (10.0.22000.739) and the user's current directory (C:\Users\91911>).

```
Microsoft Windows [Version 10.0.22000.739]
(c) Microsoft Corporation. All rights reserved.

C:\Users\91911>
```

Mac

A screenshot of a Mac terminal window. The title bar shows the name "nimisha" and the shell type "-bash" with a resolution of "80x24". The terminal displays the last login time, a message about switching to the zsh shell, and the current prompt "nimisha\$".

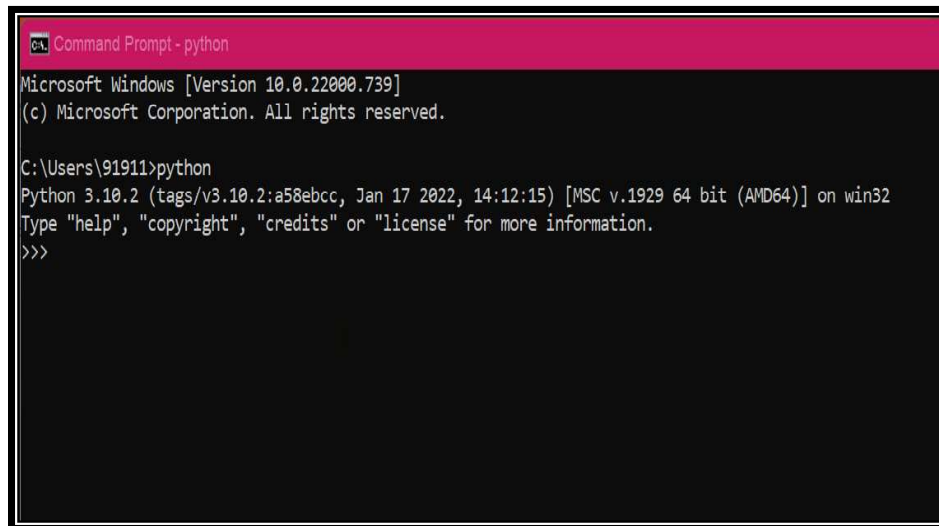
```
nimisha --bash-- 80x24
Last login: Wed Jun 22 12:24:42 on ttys000

The default interactive shell is now zsh.
To update your account to use zsh, please run 'chsh -s /bin/zsh'.
For more details, please visit https://support.apple.com/kb/HT208050.
(base) nimisha$
```

# Python: Shell

Type the command *python* to enter the python shell

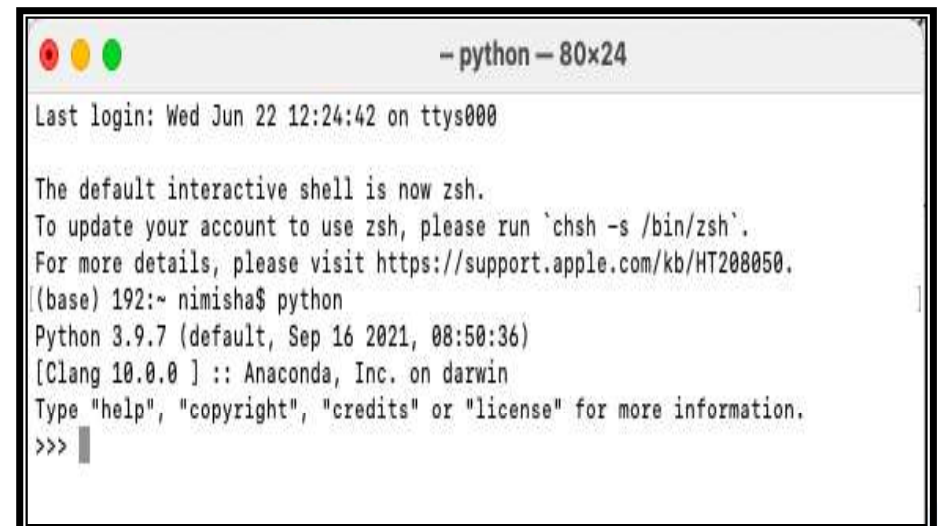
Windows



```
Command Prompt - python
Microsoft Windows [Version 10.0.22000.739]
(c) Microsoft Corporation. All rights reserved.

C:\Users\91911>python
Python 3.10.2 (tags/v3.10.2:a58ebcc, Jan 17 2022, 14:12:15) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

Mac



```
- python - 80x24
Last login: Wed Jun 22 12:24:42 on ttys000

The default interactive shell is now zsh.
To update your account to use zsh, please run `chsh -s /bin/zsh`.
For more details, please visit https://support.apple.com/kb/HT208050.
(base) 192:~ nimisha$ python
Python 3.9.7 (default, Sep 16 2021, 08:50:36)
[Clang 10.0.0 ] :: Anaconda, Inc. on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

# Python: Shell

Enter a statement to get the expected results

Windows

```
GA. Command Prompt - python
Microsoft Windows [Version 10.0.22000.739]
(c) Microsoft Corporation. All rights reserved.

C:\Users\91911>python
Python 3.10.2 (tags/v3.10.2:a58ebcc, Jan 17 2022, 14:12:15) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> 3+3
6
>>> 4*12
48
>>>
```

Mac

```
- python — 80x24
Last login: Wed Jun 22 12:24:42 on ttys000

The default interactive shell is now zsh.
To update your account to use zsh, please run `chsh -s /bin/zsh`.
For more details, please visit https://support.apple.com/kb/HT208050.
(base) 192:~ nimisha$ python
Python 3.9.7 (default, Sep 16 2021, 08:50:36)
[Clang 10.0.0] :: Anaconda, Inc. on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> 3 + 3
6
>>> 4 * 12
48
>>>
```

# Python: Shell

Enter the command *quit()* to exit from the environment

Windows

```
CA Command Prompt
Microsoft Windows [Version 10.0.22000.739]
(c) Microsoft Corporation. All rights reserved.

C:\Users\91911>python
Python 3.10.2 (tags/v3.10.2:a58ebcc, Jan 17 2022, 14:12:15) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> 3+3
6
>>> 4*12
48
>>> quit()

C:\Users\91911>
```

Mac

```
-- -bash -- 80x24
Last login: Wed Jun 22 12:24:55 on ttys002

The default interactive shell is now zsh.
To update your account to use zsh, please run `chsh -s /bin/zsh`.
For more details, please visit https://support.apple.com/kb/HT208050.
(base) 192:~ nimisha$ python
Python 3.9.7 (default, Sep 16 2021, 08:50:36)
[Clang 10.0.0 ] :: Anaconda, Inc. on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> 3 + 3
6
>>> 4 * 12
48
>>> quit()
(base) 192:~
```

## Python: Jupyter

Jupyter is a project and a community to create open-source software, open standards, and services for interactive computing across dozens of programming languages.

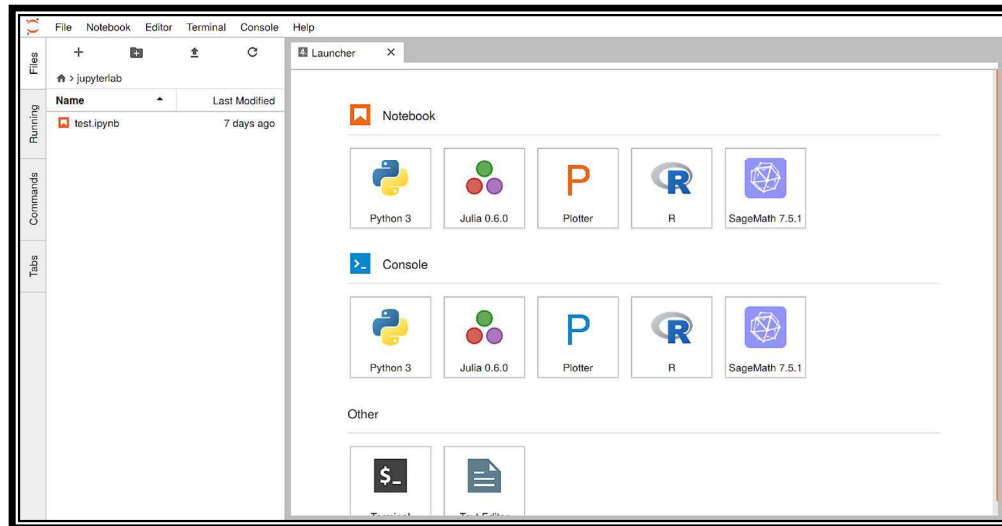
Jupyter can be accessed through three main environments:



Image source : <https://jupyter.org/try>

# Python: Jupyter Lab

The Jupyter lab can be used to access Python and has the below features:



- The most recent web-based interactive development environment for code, data, and notebooks is Jupyter lab.
- Users can configure and arrange workflows in data science, scientific computing, computational journalism, and machine learning using the Jupyter lab.



## Python: Jupyter Lab Installation

Enter the following commands to access the jupyter lab:

**Step 1:** Jupyter lab can be installed with *pip*.

```
pip install jupyterlab
```

**Step 2:** Once installed, launch Jupyter lab with the below command:

```
jupyter-lab
```

# Python

Duration: 20 minutes

Why does every programming language have an IDE?

- What is an IDE?

Answer: An integrated development environment (IDE) is a software suite that consolidates the tools required to write and test software.

- Is Jupyter notebook an IDE?

Answer: Yes, Jupyter notebook is a Python IDE.

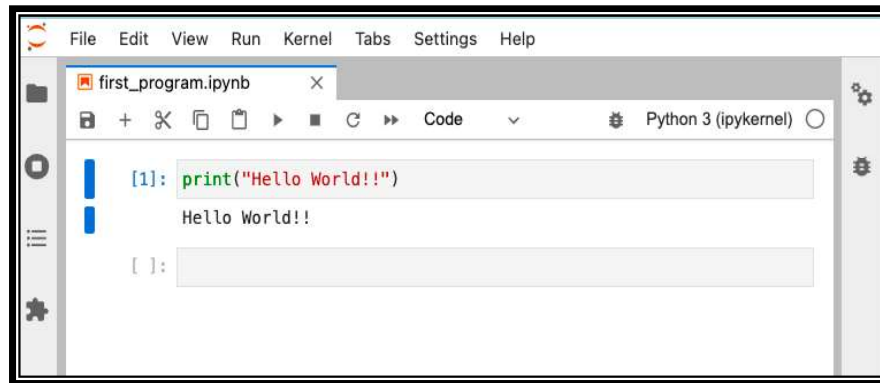




## First Python Program

# Python: First Program

The following is a simple Python program to print values:



The screenshot shows a Jupyter Notebook window titled 'first\_program.ipynb'. The interface includes a menu bar (File, Edit, View, Run, Kernel, Tabs, Settings, Help) and a toolbar with icons for saving, adding, deleting, and running code. The code editor displays a single cell with the following content:

```
[1]: print("Hello World!!")  
Hello World!!  
[ ]:
```

The output of the code is 'Hello World!!'.

- `print()` is a built-in function used to display a specified message to the screen.
- The message can be:
  - A string
  - An integer
  - any other object
- The object will be converted into a string before being written to the screen.

## Assisted Practice : First Python Program



**Objective:** In this demonstration, we will learn how to write and execute a simple python program

**Tasks to perform:**

1. Open a new notebook on Jupyter lab
2. Write and execute a program to print "Hello World!"

## Python: Code Execution

A Python program can be executed in two ways:

1. A Python program can be executed by writing directly on the command line.

```
>>> print("Hello World")
Hello World
>>> █
```

2. A Python program can be executed as a batch file where a python file is created on a code editor, saved using the ".py" file extension, and then run on the command line.

```
$ python test.py
```

The background features several abstract geometric shapes. A large blue shape is in the top-left corner. Below it and to the right are several light blue shapes, including a large parallelogram and a smaller diamond. On the far right, a light blue shape extends from the top edge. In the bottom-left corner, there is a small light blue shape pointing towards the center.

## **Python Programming Features**



**Discussion**



# Python

Duration: 20 minutes

Is adding indentations and comments a good programming practice?

- What are indentations?
- Why are comments required?



# Python: Identifier

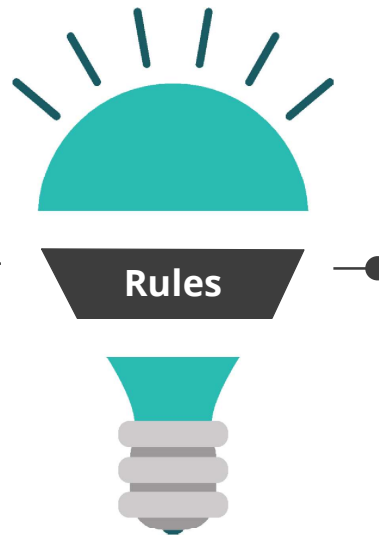
A Python identifier is a name used to identify a variable, function, class, module, or another object.

There are few identifier naming rules which are as follows:

Identifiers can be a combination of:

- letters in lowercase (a to z) or uppercase (A to Z)
- digits ( 0 – 9 )
- underscore ( \_ )

An identifier cannot start with a digit, and it can be of any length.



Special symbols like! @, #, \$, % cannot be used in an identifier

Keywords like global, and class cannot be used as identifiers.

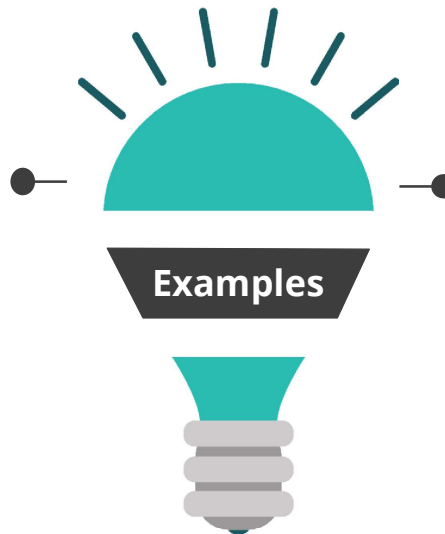
Python is case-sensitive where *a is not equal to A.*

# Python: Identifier

Few Examples of Identifiers are as follows

Valid Identifiers are

- myClass,
- var\_1,
- count



Invalid Identifiers are

- 1variable,
- class@new,
- global

## Python: Indentation

Indentation refers to the spaces at the beginning of a code line.  
The importance of indentation in Python is provided below:

### Correct Syntax

```
[1]: if 5 > 2:  
      print("5 is greater than 2")  
5 is greater than 2
```

### Incorrect Syntax

```
[2]: if 5 > 2:  
      print("5 is greater than 2")  
  
Input In [2]  
      print("5 is greater than 2")  
      ^  
IndentationError: expected an indented block
```

- Python's indentation is crucial, unlike in other programming languages where it serves to make the code easier to understand.
- Python uses indentation to indicate a block of code:  
Example: for if ... else, for loop, while loop.
- An indented block of code begins with ":"

## Python: Comments

Comments are programmer-readable explanations in a program:

Example :

```
[3]: # This is a comment  
    print("Hello World!!")  
Hello World!!
```

- Comments are annotations in the source code of a computer program.
- Comments make it easier for humans to understand the source code.
- A comment in python starts with '#' and the rest of the line is considered a comment.

# Python

Duration: 20 minutes

Is adding indentations and comments a good programming practice?

- What are indentations?

Answer: Indentation refers to the spaces at the beginning of a code line. Python's indentation is crucial unlike in other programming languages, where it serves to make the code easier to understand.

- Why are comments required?

Answer: Comments are programmer-readable explanations in a program. Comments make it easier for humans to understand the source code.



## Key Takeaways

- Python was developed by Guido Van Rossum.
- Python is an interpreted language but is a very powerful programming language with complex data structures and reusable modules.
- IDE such as JupyterLab, Atom, Spyder, and PyCharm is used to access Python.
- Python syntax is simple to use, and indentation is used to mark the block of code.





## Knowledge Check



**Knowledge  
Check**

**1**

**Python was invented by \_\_\_\_.**

- A. Guido Van Rossum
- B. Dennis MacAlistair Ritchie
- C. James Gosling
- D. None of the above



Knowledge  
Check

1

Python was invented by \_\_\_\_\_.

- A. Guido Van Rossum
- B. Dennis MacAlistair Ritchie
- C. James Gosling
- D. None of the above

---

The correct answer is **A**

---

**Python was invented by Guido Van Rossum (CWI, Amsterdam.)**



**Knowledge  
Check**

**2**

**The advantages of Python are:**

- A. Flexible
- B. Easy to use
- C. Readability
- D. All of the above



Knowledge  
Check

2

The advantages of Python are:

- A. Flexible
- B. Easy to use
- C. Readability
- D. All of the above

---

The correct answer is **D**

---

**Python aids in cross-platform compatibility, uses a minimal amount of code to complete tasks, and places a strong emphasis on readable code.**



**Knowledge  
Check**  
**3**

Python code can be written in any text editor and saved using the \_\_\_\_ extension in the system.

- A. .pytxt
- B. .python
- C. .py
- D. All of the above



**Knowledge  
Check**  
**3**

Python code can be written in any text editor and saved using the \_\_\_\_ extension in the system.

- A. .pytxt
- B. .python
- C. .py
- D. All of the above

---

The correct answer is **C**

---

**Python code can be written in any text editor and saved using the “.py” extension in the system.**





**Thank You**