

# Programming Refresher



# Introduction to Python Programming



# Learning Objectives

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

- 👁️ Install Python and its IDE to set up the programming environment
- 👁️ Use Jupyter Notebook to write and execute Python programs
- 👁️ Write and execute a Python program to perform simple tasks such as printing "Hello World!"
- 👁️ Apply Python identifiers, indentation, and comments to write clear and structured code



## Business Scenario

ABC Inc. is exploring artificial intelligence projects. The organization is struggling to choose the right programming language for its projects, prioritizing functionality, scalability, efficiency, and developer experience.

After evaluating various options, Python emerged as the ideal choice for all prospective projects because it is simple, secure, scalable, and rich in built-in libraries.

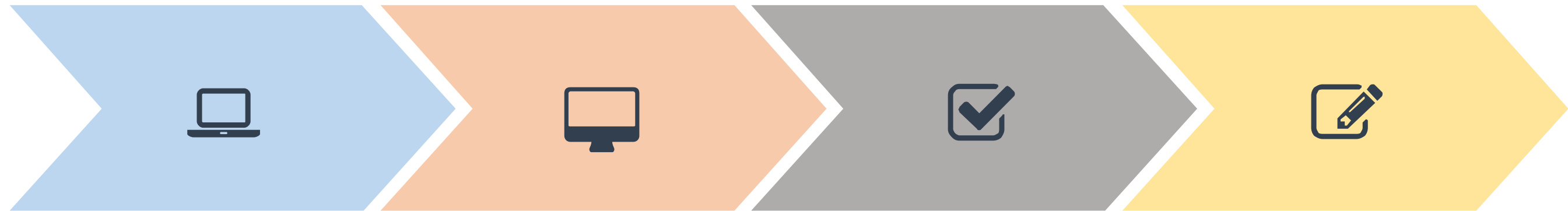




# Introduction to Python

# Python: History

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



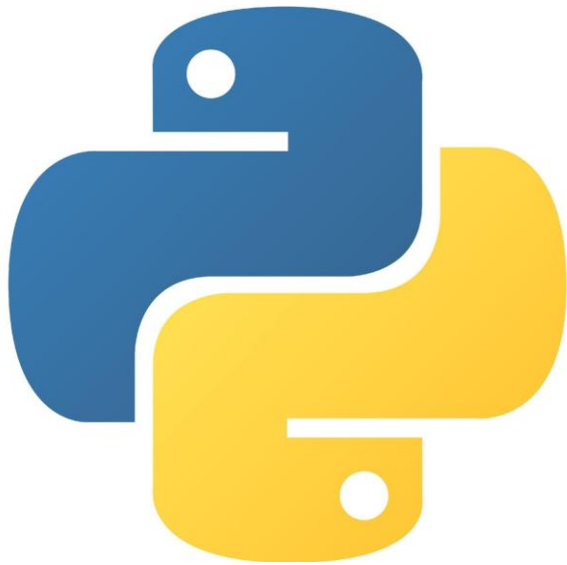
Python was invented by Guido van Rossum (CWI, Amsterdam).

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 the ABC, Modula-3, Lisp, and C languages.

# All about Python



- 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, encouraging program modularity and code reuse.
- Python is a free and open-source language.

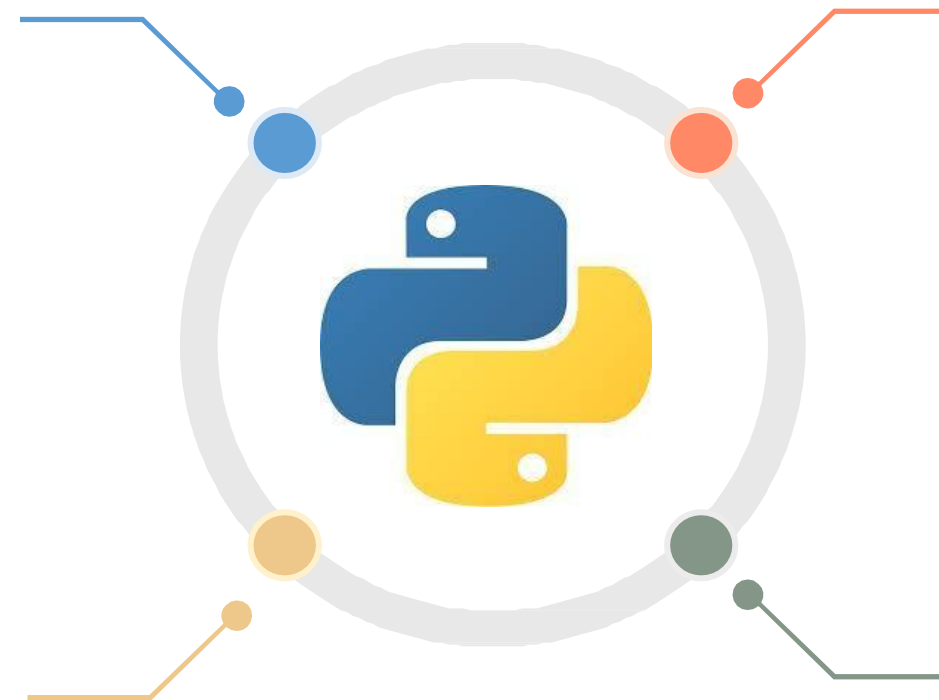
# Python: Advantages

## 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 a 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 libraries and third-party utilities</li></ul>
Compatible	<ul style="list-style-type: none"><li>• Can be easily <b>glued</b> to components written in other languages</li><li>• Allows for adding functionality to existing systems</li></ul>

# Python: Industrial Use Cases

Python is widely used in the following platforms:

## **YouTube**

Python is one of the key programming languages used in the backend of the YouTube video-sharing system, particularly for data analysis and handling metadata.

## **Google**

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

## **Dropbox**

The server and client's software for 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 as a Python program.

## Netflix

Python is used throughout the **full content life cycle** at Netflix.



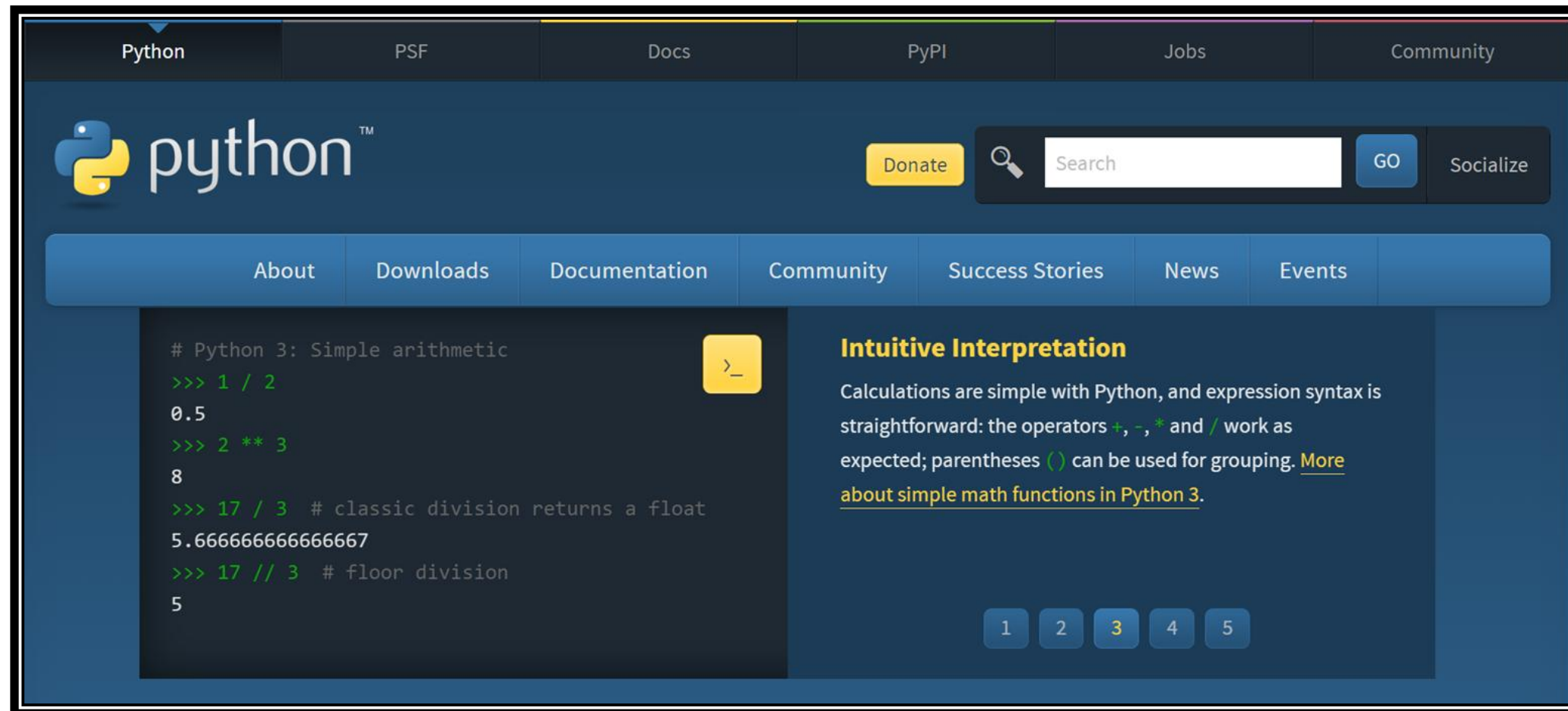
# Python Installation

# Python: Installation

There are two ways to install Python:

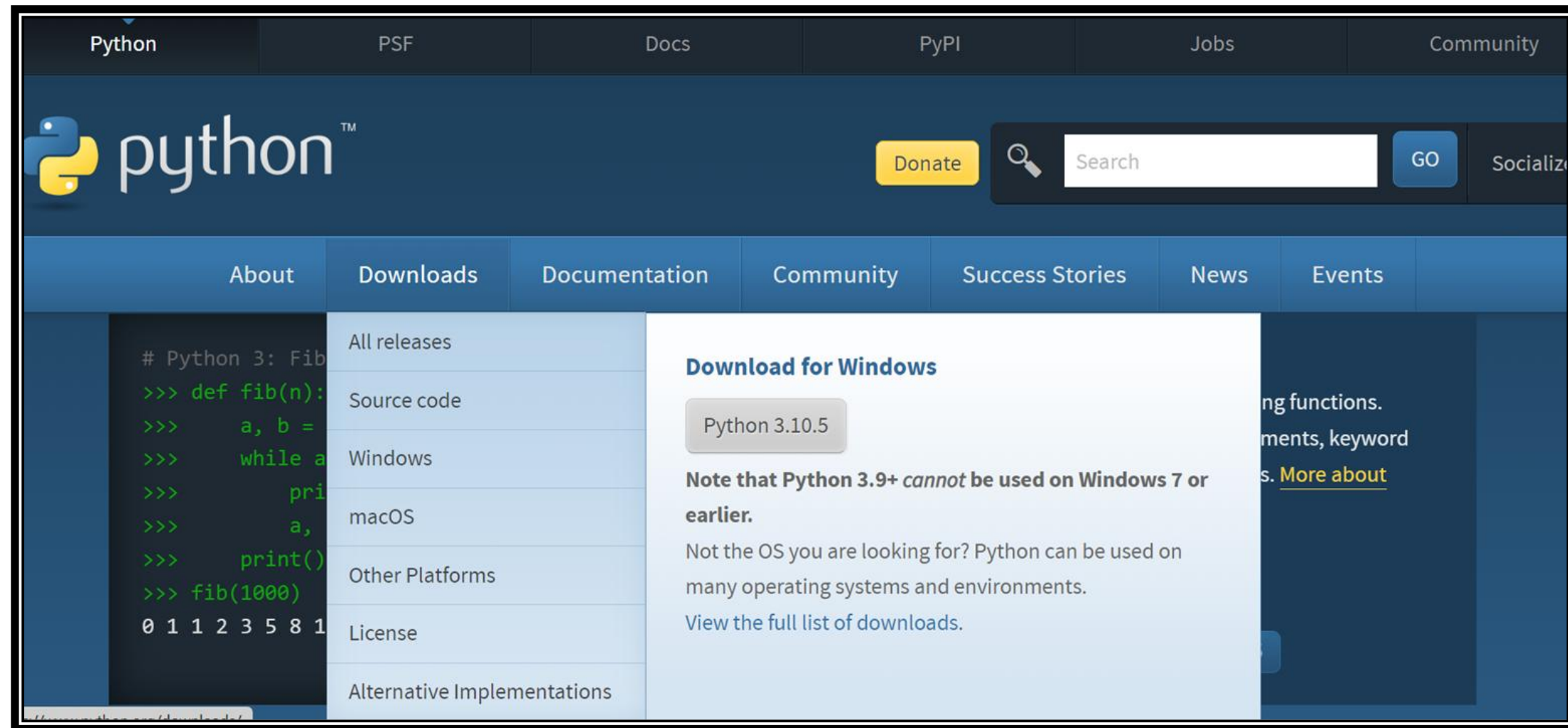
## 1. Install Python using the URL

**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

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



# Python: Installation

There are two ways to install Python:

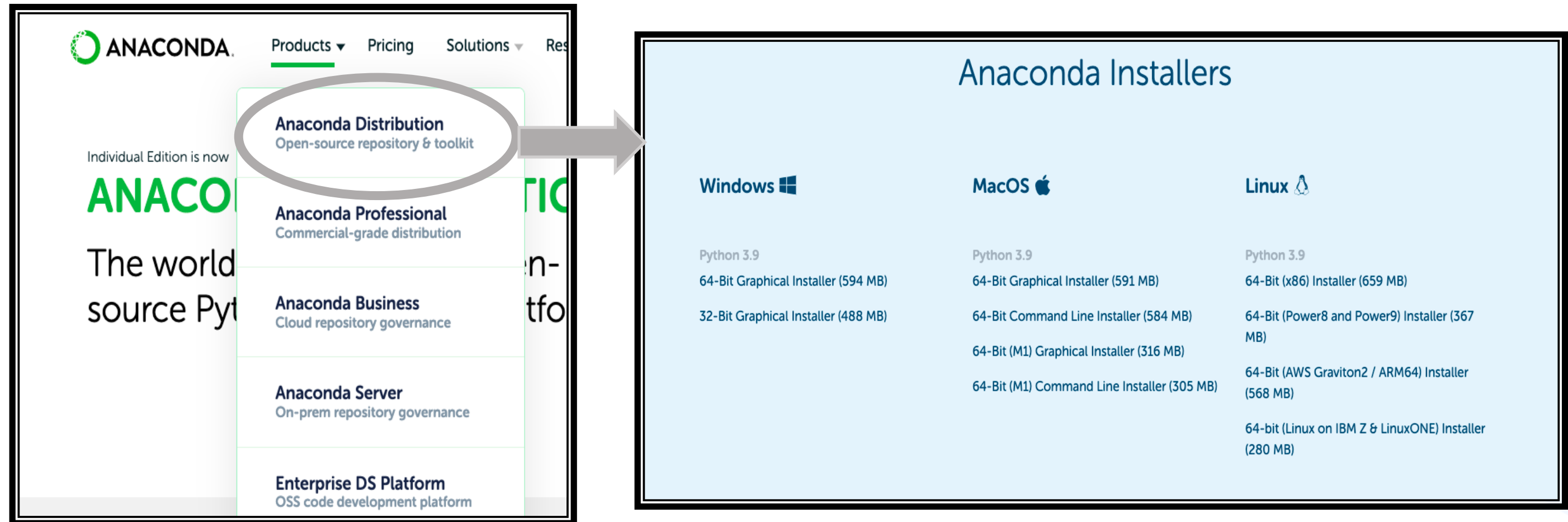
## 2. Install Python from the Anaconda file distribution system

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

The screenshot displays the Anaconda website's 'Products' page. The navigation bar at the top includes links for Products, Pricing, Solutions, Resources, Partners, Blog, and Company, along with a 'Contact Sales' button. The main content area features a list of products: 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' product. To the right, a large image of the 'Anaconda Distribution' download page is shown, with a red box labeled 'Recommended' pointing to the 'Download' button. The download page also lists 'Python 3.9 • 64-Bit Graphical Installer • 591 MB' and provides links to 'Get Additional Installers' for Windows, macOS, and Linux.

# Python: Installation

**Step2.2:** The 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, highlighting 'Anaconda Distribution' (Open-source repository & toolkit). An arrow points from this menu item to the right, where a page titled 'Anaconda Installers' is displayed. This page lists download links for Windows, MacOS, and Linux, categorized by Python version (3.9) and installer type (Graphical or Command Line).

Operating System	Python Version	Installer Type	File Size
Windows	Python 3.9	64-Bit Graphical Installer	594 MB
		32-Bit Graphical Installer	488 MB
MacOS	Python 3.9	64-Bit Graphical Installer	591 MB
		64-Bit Command Line Installer	584 MB
		64-Bit (M1) Graphical Installer	316 MB
	Python 3.9	64-Bit (M1) Command Line Installer	305 MB
		64-Bit (x86) Installer	659 MB
		64-Bit (Power8 and Power9) Installer	367 MB
Linux	Python 3.9	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, you 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 **Downloads** to download Python



# Python IDE

# Python IDE

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



Eric



Wing



Atom



PyDev



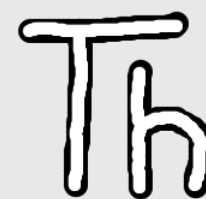
PyCharm



Jupyter  
Notebook



Rodeo



Thonny



Spyder



Microsoft  
VS Code

# Python: Interpreter

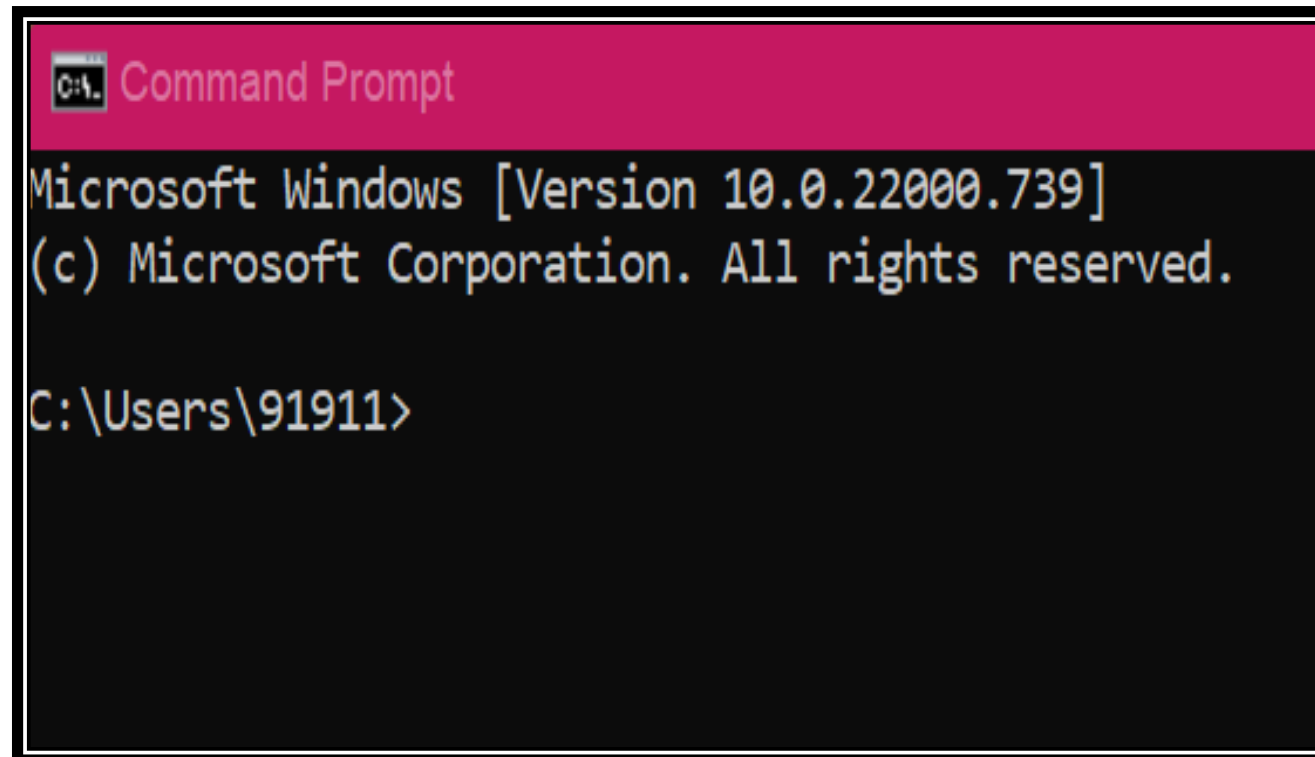


- Python code can be written in any text editor and saved using the **.py** extension in the system.
- Python is characterized as a REPL (Read-Eval-Print Loop) language because of the way its interpreter works, it:
  - Reads the command
  - Executes the command
  - Outputs the results
  - Loops back to read it again (read, evaluate, print, and 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 "C:\> Command Prompt". The main area is black with white text. It shows the Microsoft Windows version (10.0.22000.739) and copyright information. The current directory is C:\Users\91911>.

```
C:\> Command Prompt
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 is light gray and says "nimisha - -bash - 80x24". The main area is white with black text. It shows the last login time (Wed Jun 22 12:24:42 on ttys000) and a message about switching to zsh. The prompt is (base nimisha\$).

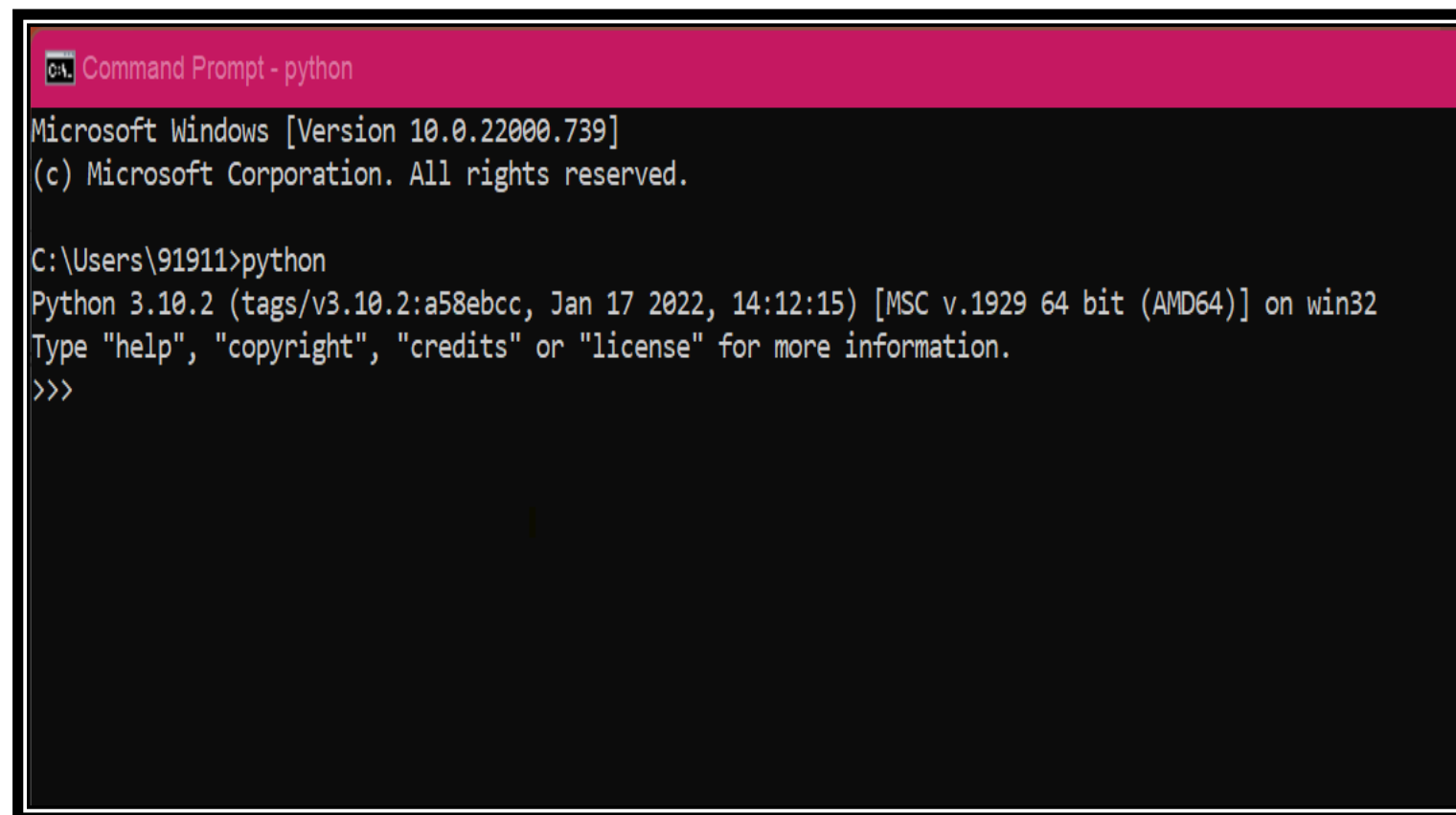
```
nimisha - -bash - 80x24
Last login: Wed Jun 22 12:24:42 on ttys000

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 **python** in your terminal or command prompt to open the Python interactive shell.

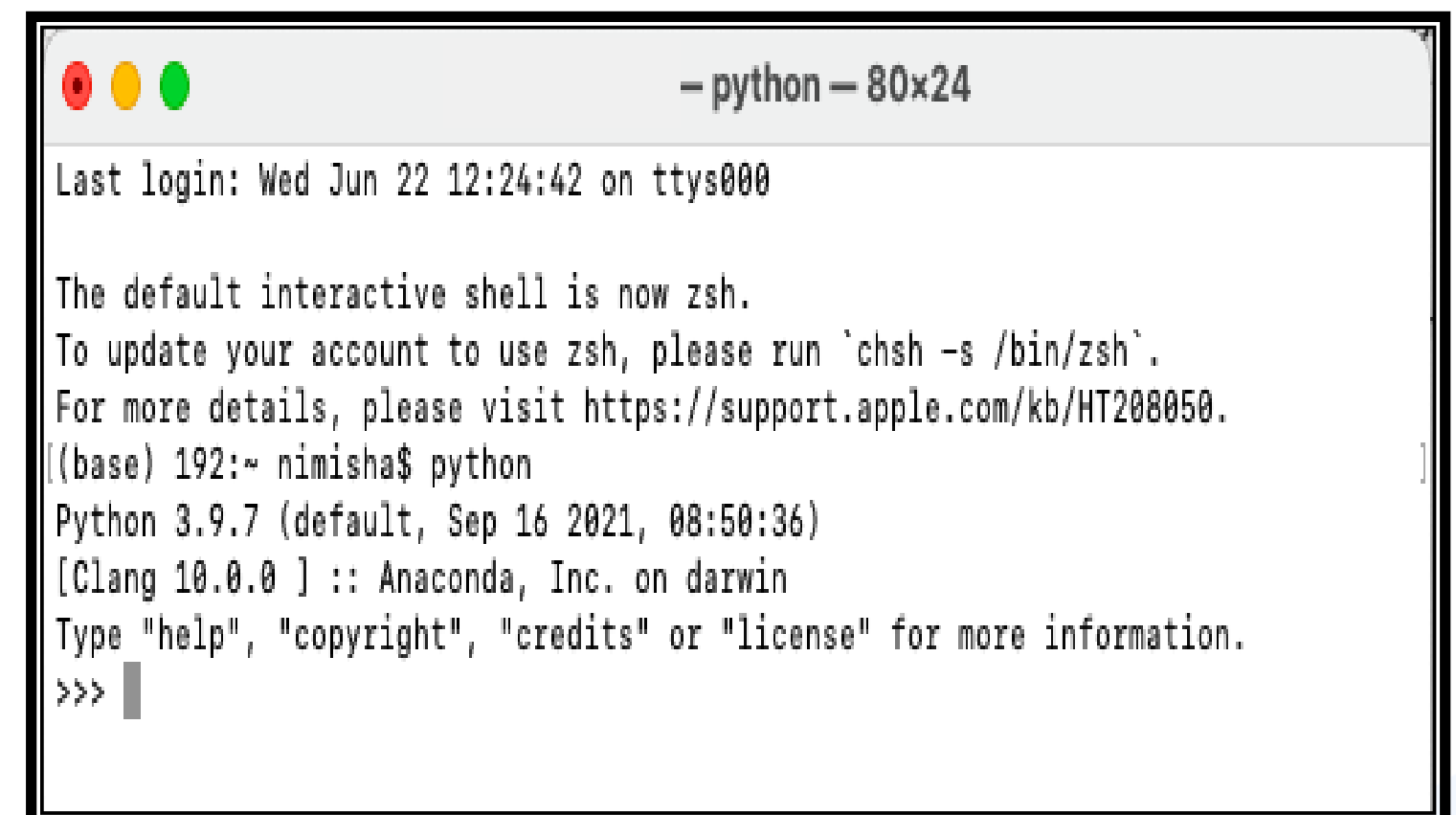
Windows

A screenshot of a Windows Command Prompt window titled "Command Prompt - python". The window has a pink title bar. The text inside shows the Microsoft Windows version (10.0.22000.739) and copyright information. The user has entered the command 'python' at the prompt 'C:\Users\91911>'. The output shows 'Python 3.10.2 (tags/v3.10.2:a58ebcc, Jan 17 2022, 14:12:15) [MSC v.1929 64 bit (AMD64)] on win32' followed by instructions to type 'help', 'copyright', 'credits', or 'license' for more information. The prompt '>>>' is visible at the end of the line.

```
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

A screenshot of a Mac terminal window titled "- python - 80x24". The window has a light gray title bar with three colored window control buttons (red, yellow, green) on the left. The text inside shows the last login time (Wed Jun 22 12:24:42 on ttys000). It then displays a message about the default interactive shell being zsh and provides instructions to update the account to use zsh. The user has entered the command 'python' at the prompt '[(base) 192:~ nimisha\$]'. The output shows 'Python 3.9.7 (default, Sep 16 2021, 08:50:36) [Clang 10.0.0 ] :: Anaconda, Inc. on darwin' followed by instructions to type 'help', 'copyright', 'credits', or 'license' for more information. The prompt '>>>' is visible at the end of the line.

```
- 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 any statement to get the expected results:

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.
>>> 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 **quit()** command to exit from the environment.

Windows

```
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:

## JupyterLab



The latest web-based  
interactive development  
environment

## Jupyter Notebook



The original web application  
for creating and sharing  
computational documents

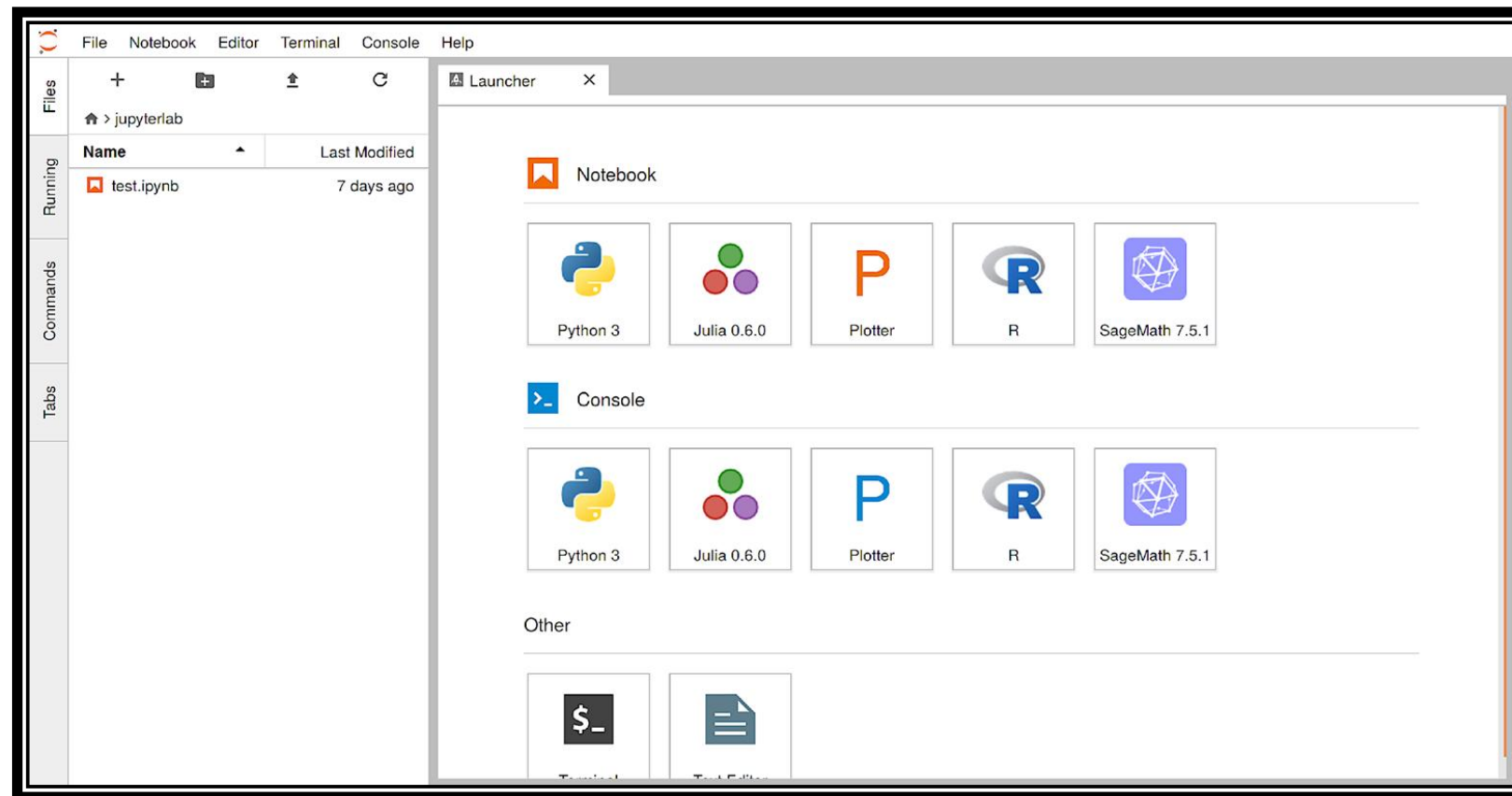
## Voilà



Share insights by converting  
notebooks into interactive  
dashboards

# Python: Jupyter Lab

The Jupyter lab can access Python and has the following 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:

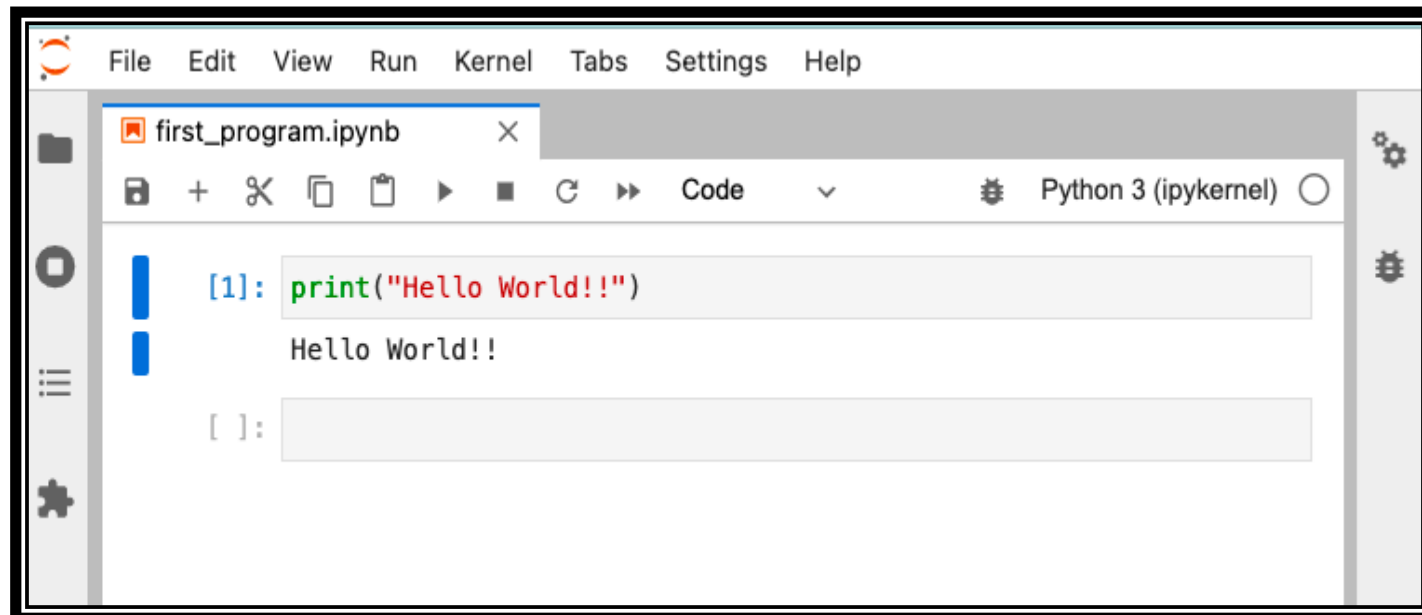
```
jupyter-lab
```



# **First Python Program**

# Python: First Program

Here's 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, copying, pasting, running, and other actions. The code area contains 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 that displays a specified message on 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 in the 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 run on the command line.

```
$ python test.py
```



# **Python Programming Features**



# Python: Identifier

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

There are a few identifier naming rules which are as follows:

Identifiers can be a combination of:

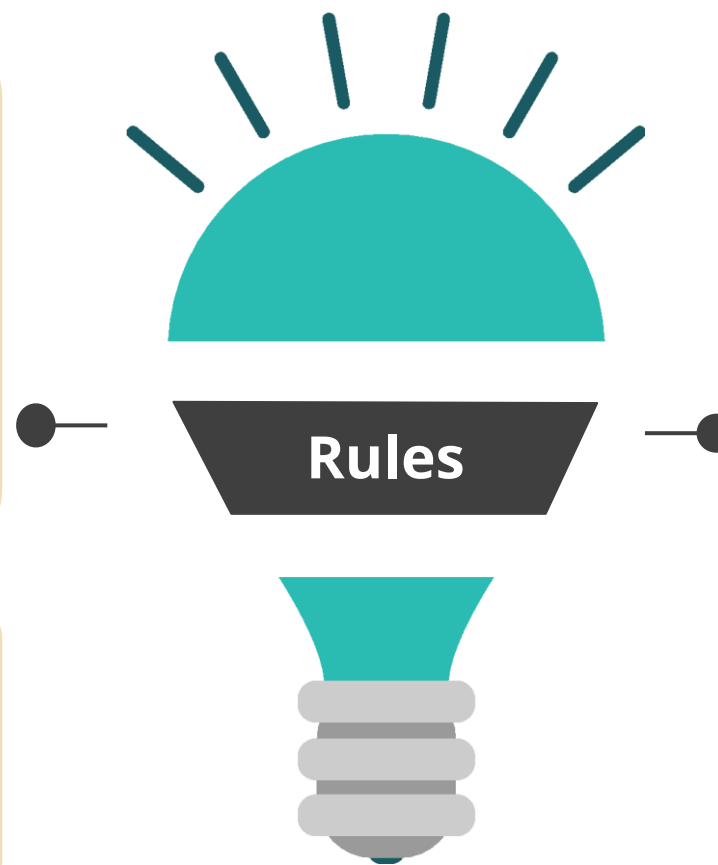
- Letters in lowercase (a to z) or uppercase (A to Z)
- Digits (0 – 9)
- Underscore ( \_ )

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*.

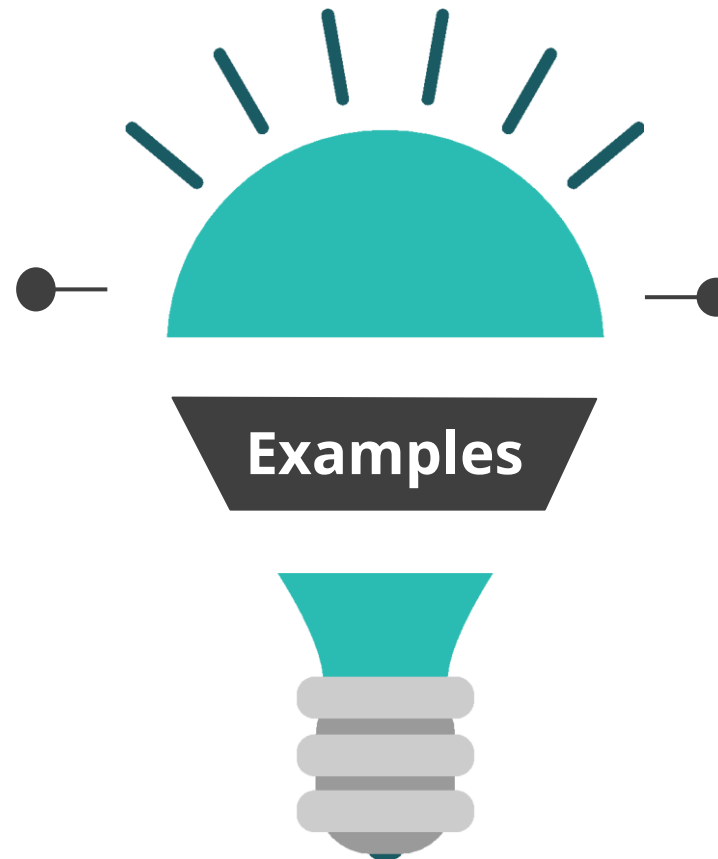


# Python: Identifier

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 makes the code easier to understand.
- Python uses indentation to indicate a block of code. For example, for if ... else, for loop, and while loop
- An indented block of code begins with ":"

# Python: Comments

Comments are programmer-readable explanations in a program.

Example:

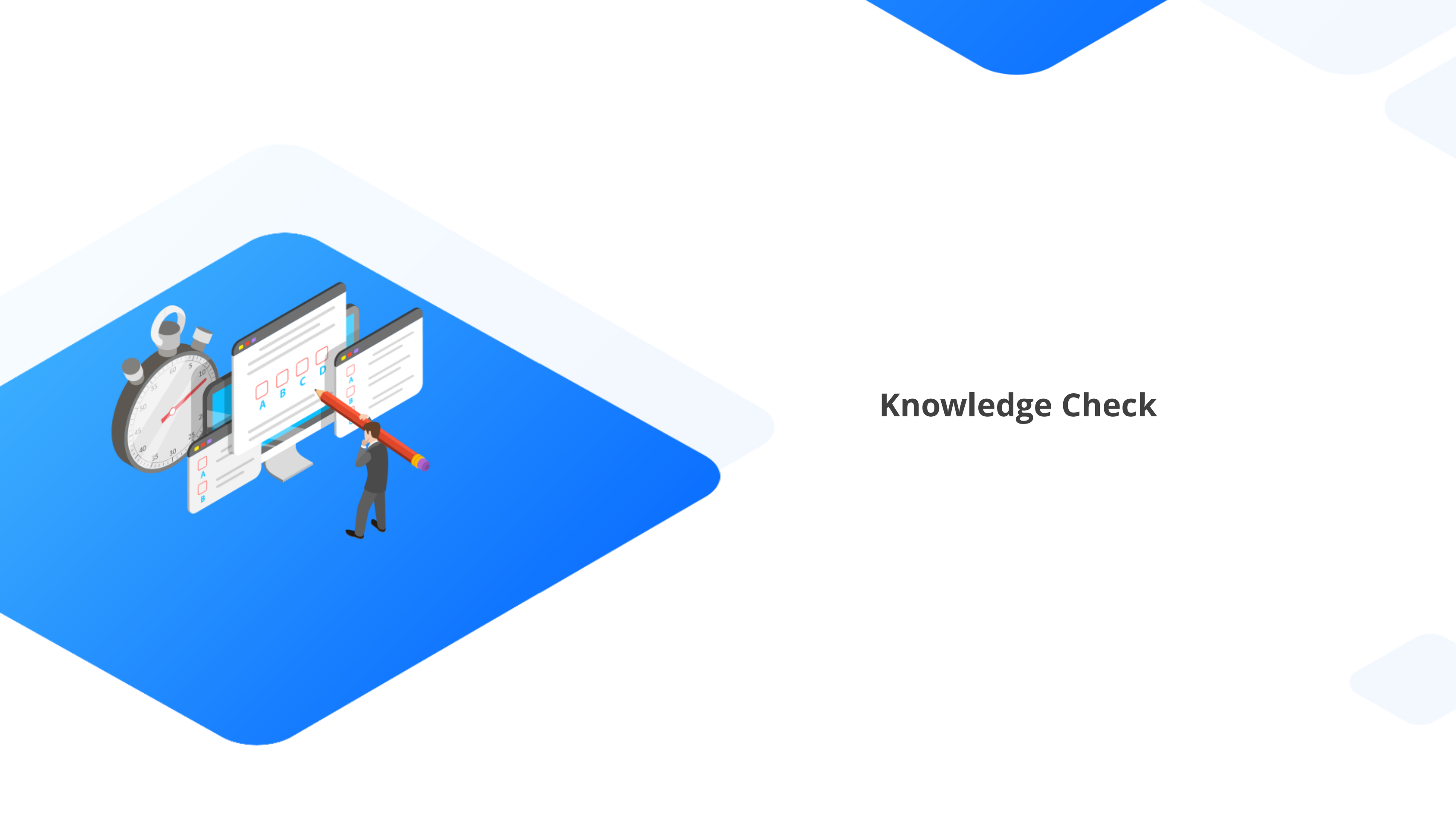
```
[3]: # This is a comment  
    print("Hello World!!")  
  
Hello World!!
```

- 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.

# Key Takeaways

- Python is an interpreted language, but it is also a powerful programming language with complex data structures and reusable modules.
- IDEs such as JupyterLab, Atom, Spyder, and PyCharm are used to access Python.
- Python syntax is simple to use, and indentation marks the code block.





## 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!**