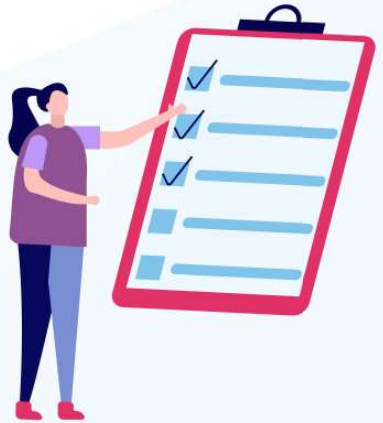
Introduction to Python Programming

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

Introduction to Python

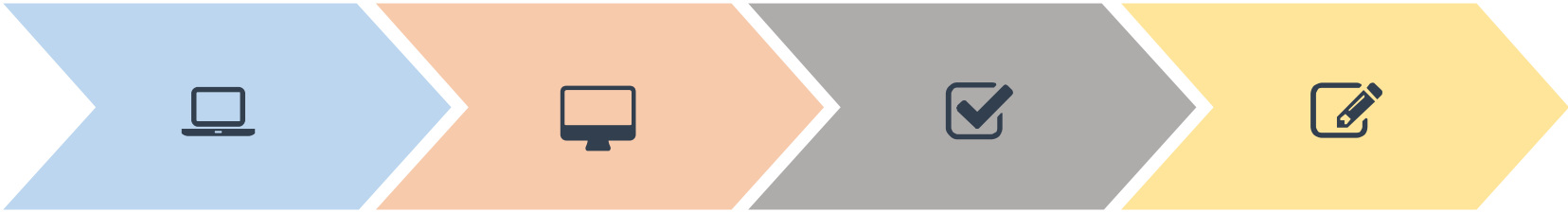
Discussion

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

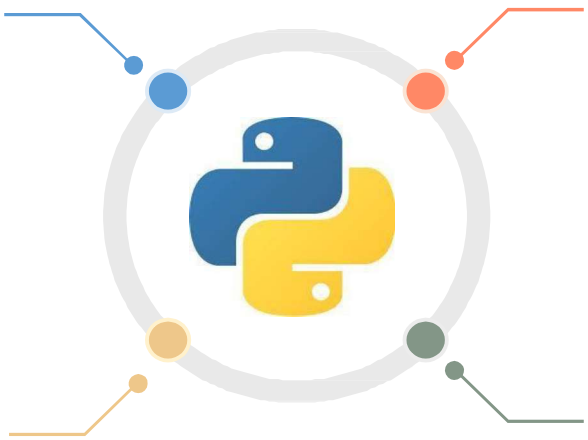
The advantages of Python are:

Flexible

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

Easy to learn and use

It uses a minimal amount of code to complete tasks.



Readability and maintenance

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

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	• Allows modification, and redistribution of the source code • Provides free license
Portable	• Can be implemented on every major platform • Can be used with Unix, Linux, MS-DOS, MS Windows, Macintosh, and IBM
Powerful	• Provides dynamic typing and automatic memory management • Provides built-in objects and tools that consist of library and third-party utilities
Compatible	• Can be easily "glued" to components written in other languages • Allows adding functionality to existing systems

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.

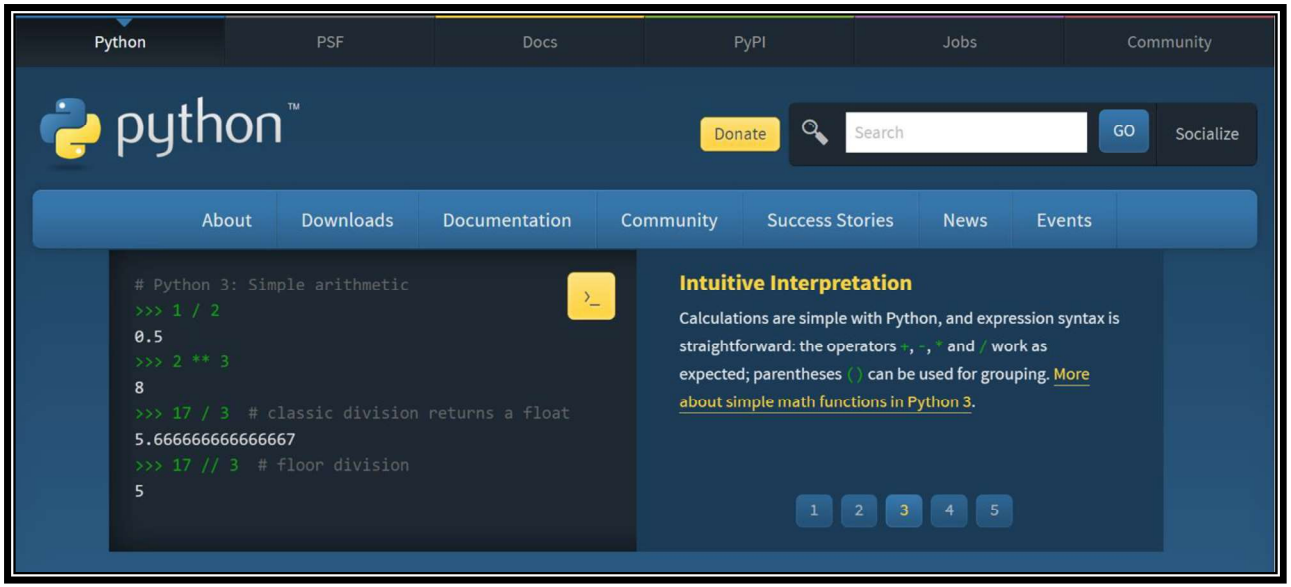
The trainees must install Python in any one of the two methods and share the output after installation.

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:

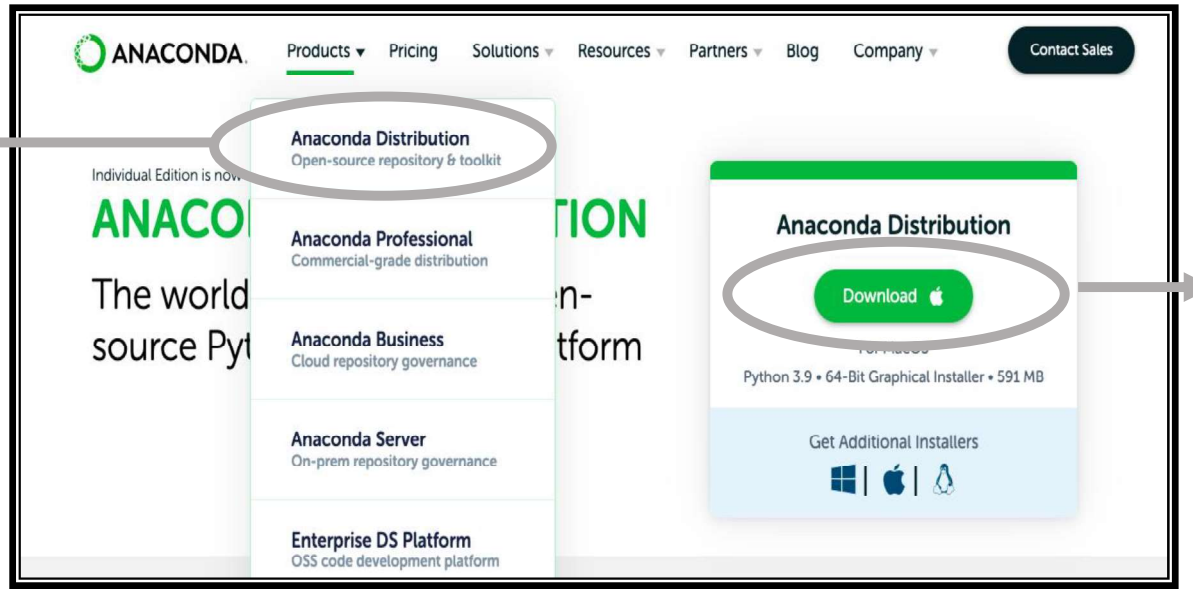
Step 1.2: Click on the *Downloads* to download Python:

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



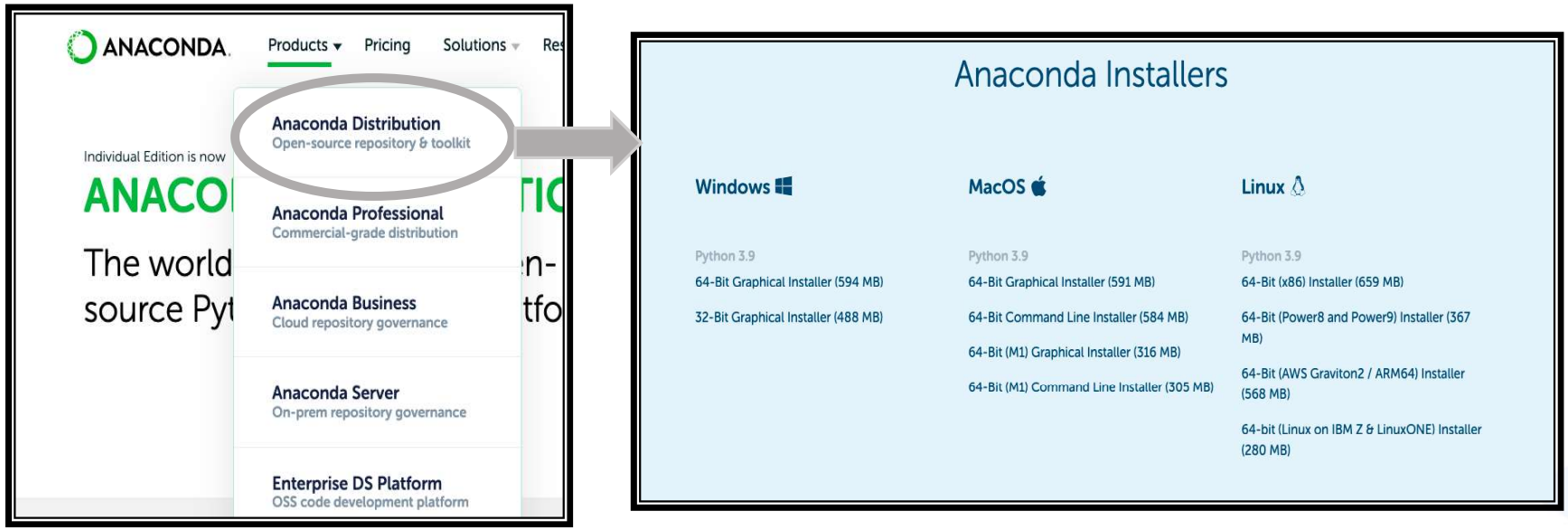
Specific platform

Recommended

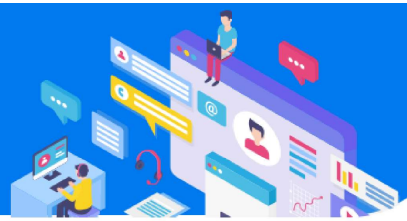
Python: Installation

There are two ways to install Python:

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



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:

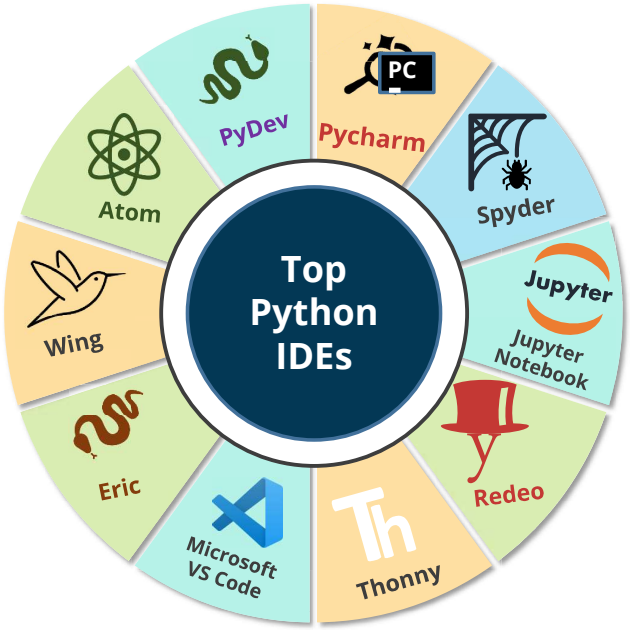


Image source: https://www.javatpoint.com/python-ides

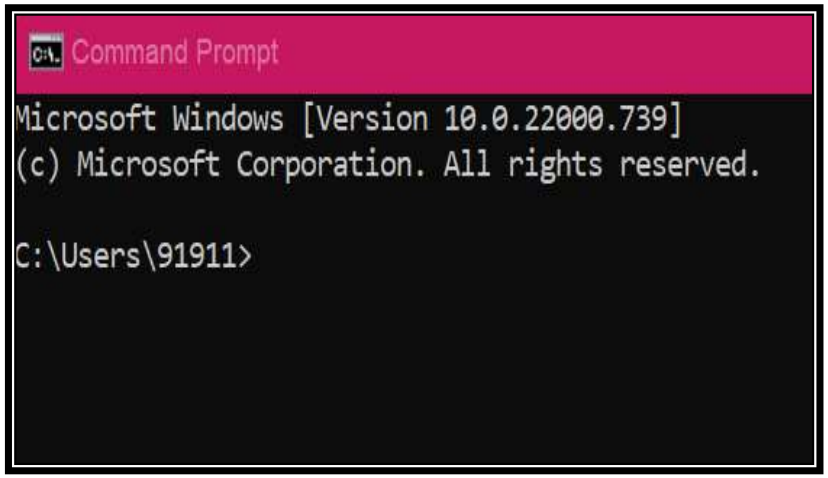
Python: Interpreter

- 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

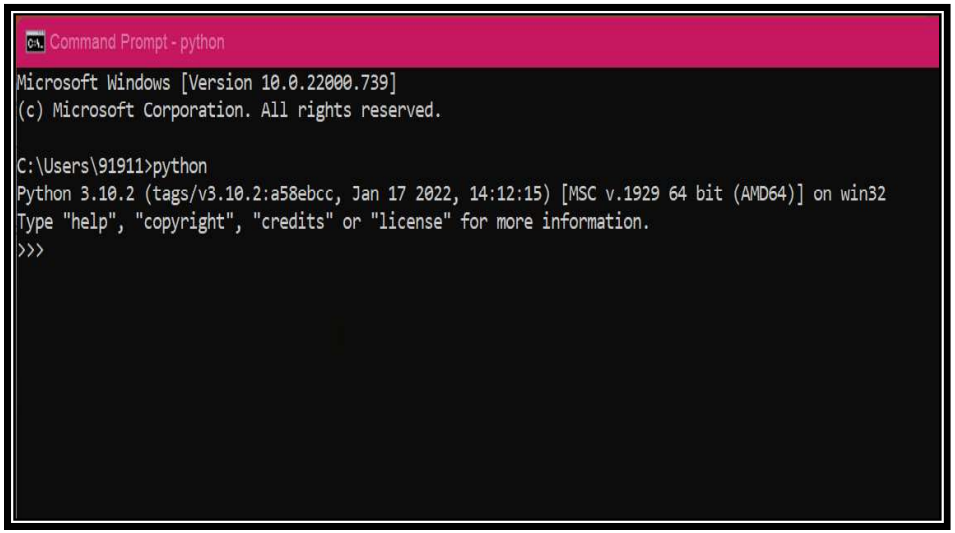


Mac

Python: Shell

Type the command *python* to enter the python shell

Windows



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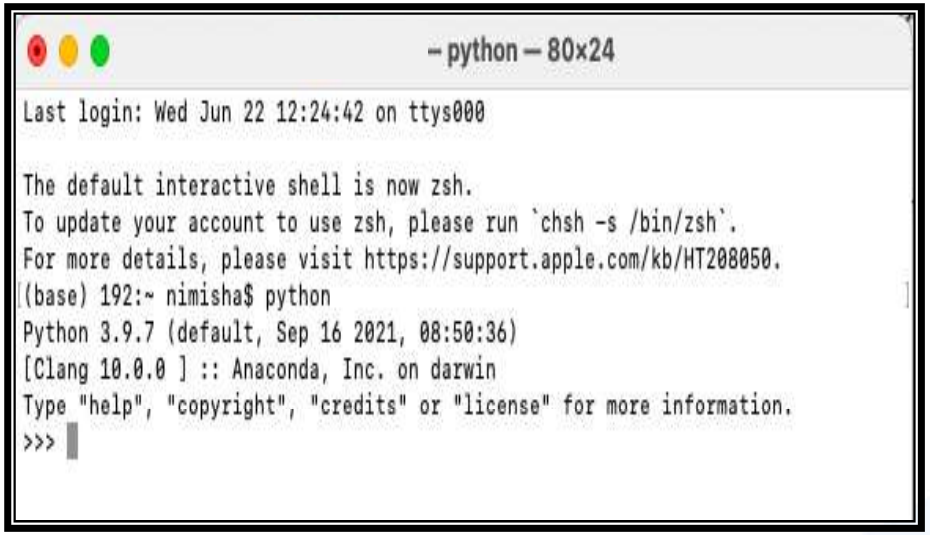


Python: Shell

Enter a statement to get the expected results

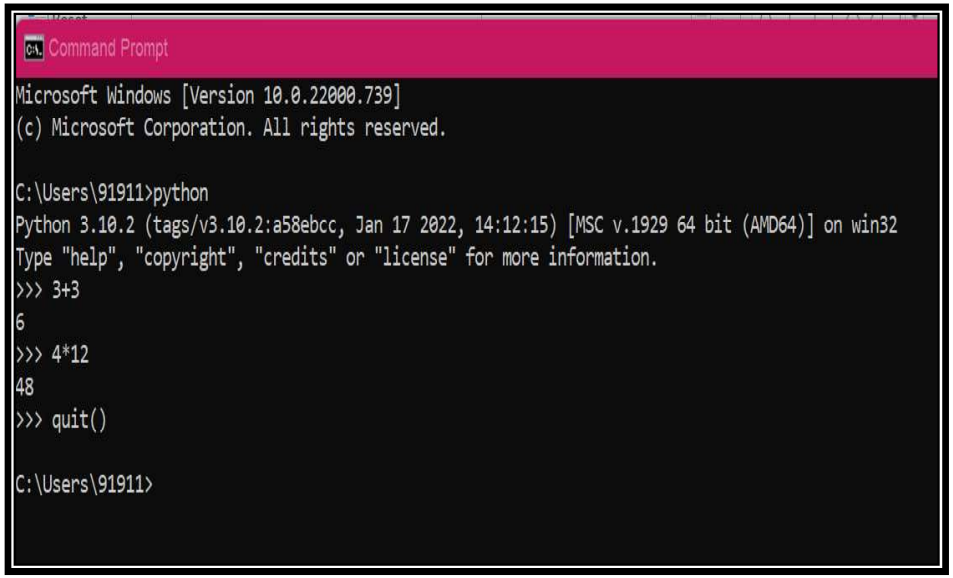
Windows

Mac

Python: Shell

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

Windows



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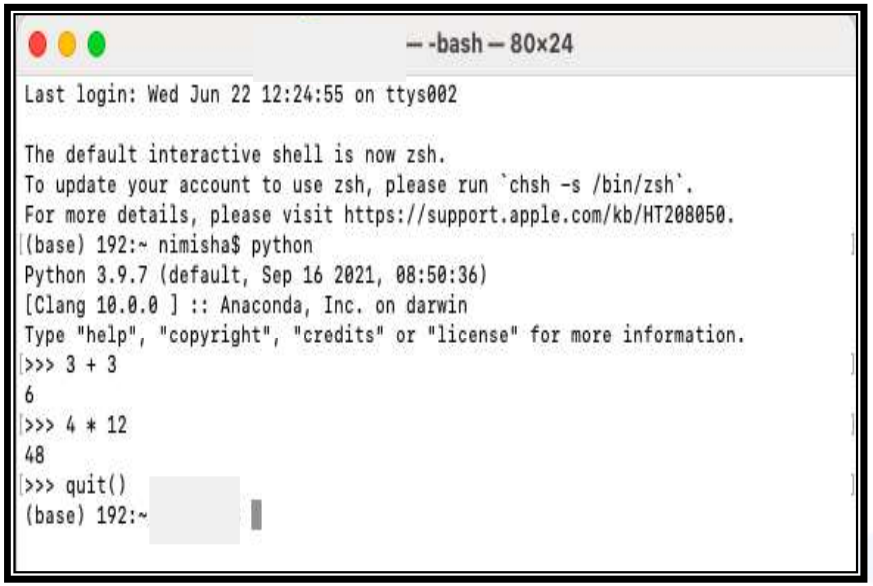


Python: Jupyter

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

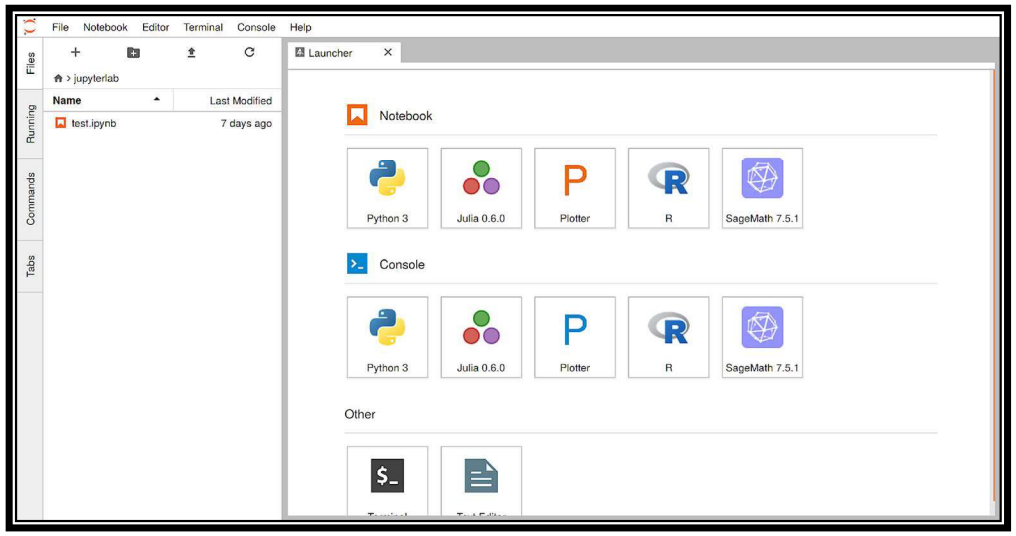
Jupyter can be accessed through three main environments:

JupyterLab	Jupyter Notebook	Voilà
The latest web-based interactive development environment	The original web application for creating and sharing computational documents	Share insights by converting notebooks into interactive dashboards

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.

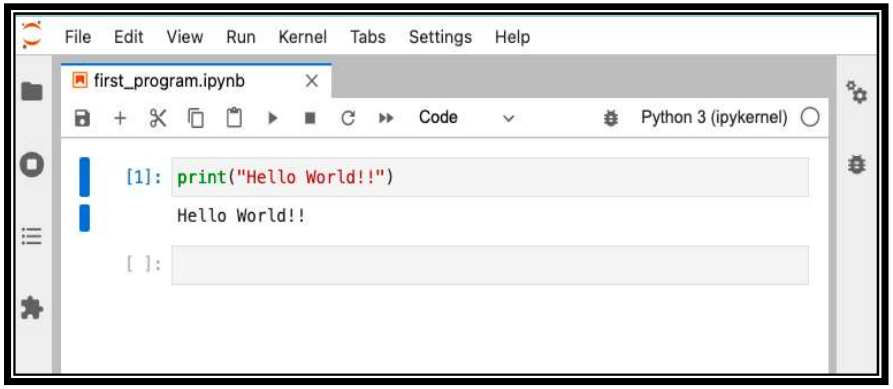
- Is Jupyter notebook an IDE?

Answer: Yes, Jupyter notebook is a Python IDE.

First Python Program

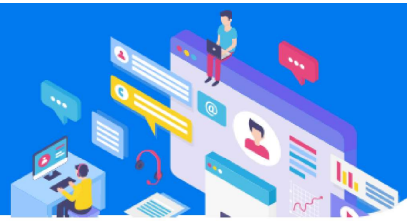
Python: First Program

The following is a simple Python program to print values:



- 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



ASSISTED PRACTICE

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
```

Python Programming Features

Discussion

Python

Duration: 20 minutes

Is adding indentations and comments a good programming practice?

- What are indentations?
- Why are comments required?

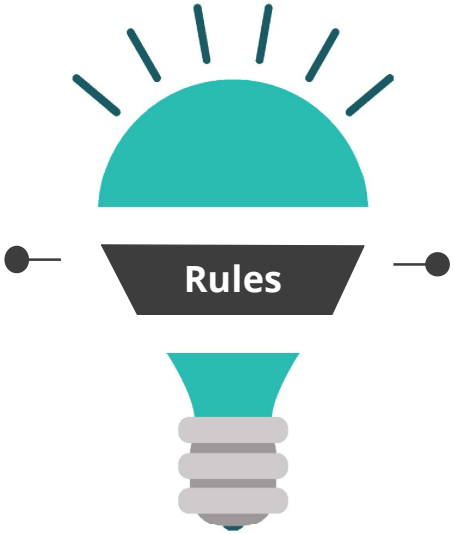
Python: Identifier

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 (_)



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

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

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

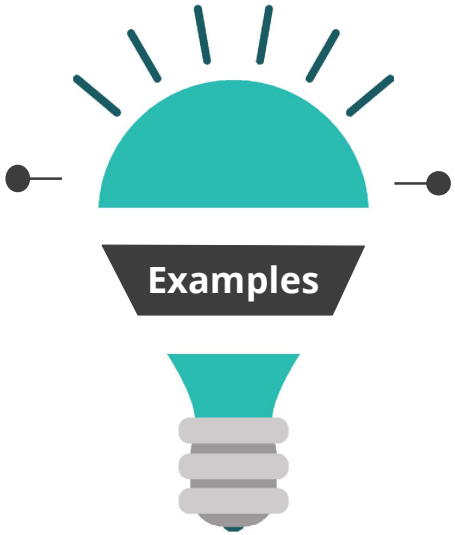
Python is case-sensitive where *a is not equal to A.*

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?

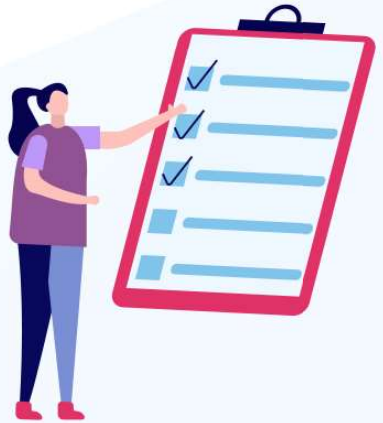
Answer: Indentation refers to the spaces at the beginning of a code line. Python's indentation is crucial unlike in other programming languages, where it serves to make the code easier to understand.

- 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