Introduction to Python Programming

Python is a high-level, general-purpose programming language.Python is dynamically typed and garbage-collected. It supports multiple programmingparadigms,including structured (particularly proced ural), object-oriented and functional programming.Guido van Rossum began working on Python in the late 1980s as a successor to the ABC programming language and first released it in 1991 as Python 0.9.0.[37] Python 2.0 was released in 2000. Python 3.0, released in 2008, was a major revision not completely backward-compatible with earlier versions. Python 2.7.18, released in 2020, was the last release of Python

Python is a dynamic, high-level, free open source, and interpreted programming language. It supports object-oriented programming as well as procedural-oriented programming. In Python, we don't need to declare the type of variable because it is a dynamically typed language. For example, x = 10 Here, x can be anything such as String, int, etc.

Features in Python

1.Free and Open Source

2. Easy to code

3. Easy to Read

4. Object-Oriented Language

5. GUI Programming Support

6. High-Level Language

7. Large Community Support

8. Easy to Debug

9. Python is a Portable language

10. Python is an Integrated language

1. Free and Open Source

Python language is freely available at the official website and you can download it from the given download link below click on the **Download Python** keyword. Download Python Since it is open-source, this means that source code is also available to the public. So you can download it, use it as well as share it.

2. Easy to code

Python is a high-level programming language. Python is very easy to learn the language as compared to other languages like C, C#, Javascript, Java, etc. It is very easy to code in the Python language and anybody can learn Python basics in a few hours or days. It is also a developer-friendly language.

3. Easy to Read

As you will see, learning Python is quite simple. As was already established, Python's syntax is really straightforward. The code block is defined by the indentations rather than by semicolons or brackets.

4. Object-Oriented Language

One of the key features of Python is Object-Oriented programming. Python supports object-oriented language and concepts of classes, object encapsulation, etc.

5. GUI Programming Support

Graphical User interfaces can be made using a module such as PyQt5, PyQt4, wxPython, or Tk in Python. PyQt5 is the most popular option for creating graphical apps with Python.

6. High-Level Language

Python is a high-level language. When we write programs in Python, we do not need to remember the system architecture, nor do we need to manage the memory.

7. Large Community Support

Python has gained popularity over the years. Our questions are constantly answered by the enormous StackOverflow community. These websites have already provided answers to many questions about Python, so Python users can consult them as needed.

8. Easy to Debug

Excellent information for mistake tracing. You will be able to quickly identify and correct the majority of your program's issues once you understand how to interpret Python's error traces. Simply by glancing at the code, you can determine what it is designed to perform.

9. Python is a Portable language

Python language is also a portable language. For example, if we have Python code for Windows and if we want to run this code on other platforms such as Linux, Unix, and Mac then we do not need to change it, we can run this code on any platform.

10. Python is an Integrated language

Python is also an Integrated language because we can easily integrate Python with other languages like C, C++, etc.

11. Interpreted Language:

Python is an Interpreted Language because Python code is executed line by line at a time. like other languages C, C++, Java, etc. there is no need to compile Python code this makes it easier to debug our code. The source code of Python is converted into an immediate form called bytecode.

12. Large Standard Library

Python has a large standard library that provides a rich set of modules and functions so you do not have to write your own code for every single thing. There are many libraries present in Python such as regular expressions, unit-testing, web browsers, etc.

13. Dynamically Typed Language

Python is a dynamically-typed language. That means the type (for example- int, double, long, etc.) for a variable is decided at run time not in advance because of this feature we don't need to specify the type of variable.

14. Frontend and backend development

With a new project py script, you can run and write Python codes in HTML with the help of some simple tags <py-script|, <py-env|, etc. This will help you do frontend development work in Python like javascript. Backend is the strong forte of Python it's extensively used for this work cause of its frameworks like Django and Flask.

15. Allocating Memory Dynamically

In Python, the variable data type does not need to be specified. The memory is automatically allocated to a variable at runtime when it is given a value. Developers do not need to write int y = 18 if the integer value 15 is set to y. You may just type y=18.

History of Python

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.

Python is derived from many other languages, including ABC, Modula-3, C, C++, Algol-68, SmallTalk, and Unix shell and other scripting languages.

Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

Python is now maintained by a core development team at the institute, although Guido van Rossum still holds a vital role in directing its progress.

Python Variables

Creating Variables

1.Python has no command for declaring a variable.

2.A variable is created the moment you first assign a value to it.

```
x = 5
y = 'John'
print(x)
print(y)
```

3.Variables do not need to be declared with any particular *type*, and can even change type after they have been set.

```
x = 4          # x is of type int
x = 'Sally'  # x is now of type str
print(x)
```

4.Casting

If you want to specify the data type of a variable, this can be done with casting.

```
x = str(3)     # x will be '3'
y = int(3)     # y will be 3
z = float(3)  # z will be 3.0
```

5.Get the Type

You can get the data type of a variable with the type() function.

```
x = 5
y = 'John'
print(type(x))
print(type(y))
```

String variables can be declared either by using single or double quotes:

```
x = 'John'
# is the same as
x = 'John'
```

6.Case-Sensitive

Variable names are case-sensitive.

This will create two variables:

```
a = 4
A = 'Sally'
#A will not overwrite a
```

Python - Variable Names

A variable can have a short name (like x and y) or a more descriptive name (age, carname, total_volume). Rules for Python variables:

1. A variable name must start with a letter or the underscore character
2. A variable name cannot start with a number
3. A variable name can only contain alpha-numeric characters and underscores (A-z, 0-9, and _)
4. Variable names are case-sensitive (age, Age and AGE are three different variables)
5. A variable name cannot be any of the Python keywords.

Python Data Types

Built-in Data Types

In programming, data type is an important concept.

Variables can store data of different types, and different types can do different things.

Text Type:	str
Numeric Types:	int, float, complex
Sequence Types:	list, tuple, range
Mapping Type:	dict
Set Types:	set, frozenset
Boolean Type:	bool
Binary Types:	bytes, bytearray, memoryview
None Type:	NoneType

Python has the following data types built-in by default, in these categories:

Getting the Data Type

In Python, the data type is set when you assign a value to a variable:

x = "Hello World"	str
x = 20	int
x = 20.5	float
x = 1j	complex
x = ["apple", "banana", "cherry"]	list
x = ("apple", "banana", "cherry")	tuple
x = range(6)	range
x = {"name" : "John", "age" : 36}	dict
x = {"apple", "banana", "cherry"}	set
x = frozenset({"apple", "banana", "cherry"})	frozenset
x = True	bool
x = b"Hello"	bytes
x = bytearray(5)	bytearray
x = memoryview(bytes(5))	memoryview
x = None	NoneType

Setting the Specific Data Type

If you want to specify the data type, you can use the following constructor functions:

Example	Data Type
x = str("Hello World")	str
x = int(20)	int
x = float(20.5)	float
x = complex(1j)	complex
x = list(("apple", "banana", "cherry"))	list
x = tuple(("apple", "banana", "cherry"))	tuple
x = range(6)	range
x = dict(name="John", age=36)	dict
x = set(("apple", "banana", "cherry"))	set
x = frozenset(("apple", "banana", "cherry"))	frozenset
x = bool(5)	bool
x = bytes(5)	bytes
x = bytearray(5)	bytearray
x = memoryview(bytes(5))	memoryview

Python Operators

Python divides the operators in the following groups:

- Arithmetic operators
- Assignment operators
- Comparison operators
- Logical operators
- Identity operators
- Membership operators
- Bitwise operators

Python Arithmetic Operators

Arithmetic operators are used with numeric values to perform common mathematical operations:

Operator	Name	Example
+	Addition	x + y
-	Subtraction	x - y
*	Multiplication	x * y
/	Division	x / y
%	Modulus	x % y
**	Exponentiation	x ** y
//	Floor division	x // y

Python Assignment Operators

Assignment operators are used to assign values to variables:

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x - 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3
//=	x //= 3	x = x // 3
**=	x **= 3	x = x ** 3
&=	x &= 3	x = x & 3
|=	x |= 3	x = x | 3
^=	x ^= 3	x = x ^ 3
>>=	x >>= 3	x = x >> 3
<<=	x <<= 3	x = x << 3

Python Comparison Operators

Comparison operators are used to compare two values:

Operator	Name	Example
==	Equal	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

Python Logical Operators

Logical operators are used to combine conditional statements:

Operator	Description	Example
and	Returns True if both statements are true	x < 5 and x < 10
or	Returns True if one of the statements is true	x < 5 or x < 4
not	Reverse the result, returns False if the result is true	not(x < 5 and x < 10)

Python Identity Operators

Identity operators are used to compare the objects, not if they are equal, but if they are actually the same object, with the same memory location:

Operator	Description	Example
is	Returns True if both variables are the same object	x is y
is not	Returns True if both variables are not the same object	x is not y

Python Membership Operators

Membership operators are used to test if a sequence is presented in an object:

Operator	Description	Example
in	Returns True if a sequence with the specified value is present in the object	x in y
not in	Returns True if a sequence with the specified value is not present in the object	x not in y

Python Bitwise Operators

Bitwise operators are used to compare (binary) numbers:

Operator	Name	Description	Example
&	AND	Sets each bit to 1 if both bits are 1	x & y
|	OR	Sets each bit to 1 if one of two bits is 1	x | y
^	XOR	Sets each bit to 1 if only one of two bits is 1	x ^ y
~	NOT	Inverts all the bits	~x
<<	Zero fill left shift	Shift left by pushing zeros in from the right and let the leftmost bits fall off	x << 2
>>	Signed right shift	Shift right by pushing copies of the leftmost bit in from the left, and let the rightmost bits fall off	x >> 2

Python Conditional Statements

```
# python program to illustrate nested If statement

i = 10
if (i == 10):

    #   First if statement
    if (i < 15):
        print('i is smaller than 15')

    # Nested - if statement
    # Will only be executed if statement above
    # it is true
    if (i < 12):
        print('i is smaller than 12 too')
    else:
        print('i is greater than 15')
```

Python For Loops

A for loop is used for iterating over a sequence (that is either a list, a tuple, a dictionary, a set, or a string).

This is less like the for keyword in other programming languages, and works more like an iterator method as found in other object-orientated programming languages.

With the for loop we can execute a set of statements, once for each item in a list, tuple, set etc.

Example

Print each fruit in a fruit list:

```
fruits = ['apple', 'banana', 'cherry']
for x in fruits:

 print(x)
```

```
for x in 'banana':
  print(x)
```

While loop

With the while loop we can execute a set of statements as long as a condition is true.

Example:

Print i as long as i is less than 6:

```
i = 1
while i < 6:
  print(i)
  i += 1
```

Output:

1
2
3
4
5

The break Statement

With the break statement we can stop the loop even if the while condition is true:

Example

Exit the loop when i is 3:

```
i = 1
while i < 6:
  print(i)
  if i == 3:
    break
  i += 1
```

output

1

2

3

Python Functions

A function is a block of code which only runs when it is called.

You can pass data, known as parameters, into a function.

A function can return data as a result

Creating a Function

In Python a function is defined using the def keyword:

```
def my_function():
  print('Hello from a function')
```

Calling a Function

To call a function, use the function name followed by parenthesis:

```
def my_function():
  print('Hello from a function')

my_function()
```

Output

```
Hello from a function
```

Arguments

Information can be passed into functions as arguments.

Arguments are specified after the function name, inside the parentheses. You can add as many arguments as you want, just separate them with a comma.

The following example has a function with one argument (fname). When the function is called, we pass along a first name, which is used inside the function to print the full name:

Example

```
def my_function(fname):
  print(fname + " Refsnes")

my_function("Emil")
my_function("Tobias")
my_function("Linus")
```

Python Modules

What is a Module ?

Consider a module to be the same as a code library.

A file containing a set of functions you want to include in your application.

Create a Module

To create a module just save the code you want in a file with the file extension .py:

Example

Save this code in a file named mymodule.py

```
def greeting(name):
  print('Hello, ' + name)
```

Use a Module

Now we can use the module we just created, by using the import statement:

Example

Import the module named mymodule, and call the greeting function:

```
import mymodule

mymodule.greeting('Jonathan')
```

Output

```
hello Jonathan
```

Variables in Module

The module can contain functions, as already described, but also variables of all types (arrays, dictionaries, objects etc):

Example

Save this code in the file mymodule.py

```
person1 = {
  "name": "John",
  "age": 36,
  "country": "Norway"
}
```

Example

Import the module named mymodule, and access the person1 dictionary:

```
import mymodule

a = mymodule.person1["age"]
print(a)
```

Naming a Module

You can name the module file whatever you like, but it must have the file extension .py

Re-naming a Module

You can create an alias when you import a module, by using the as keyword:

```
import mymodule as mx

a = mx.person1["age"]
print(a)
```

Built-in Modules

There are several built-in modules in Python, which you can import whenever you like.