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Topic: Study Data Types, Variables, Loops, Lists, Dict, Functions in Python.

Task: 1

Internship: Python Scholar Intern

What is Python

Python is a general purpose, dynamic, high-level, and interpreted programming language. It supports Object Oriented programming approach to develop applications. It is simple and easy to learn and provides lots of high-level data structures.

Python History

Python was invented by **Guido van Rossum** in 1991 at CWI in Netherland. The idea of Python programming language has taken from the ABC programming language or we can say that ABC is a predecessor of Python language.

Where is Python used?

Python is a general-purpose, popular programming language and it is used in almost every technical field. The various areas of Python use are given below.

- Data Science
- Date Mining
- Desktop Applications
- Console-based Applications
- Mobile Applications
- Software Development
- Artificial Intelligence
- Web Applications
- Enterprise Applications
- 3D CAD Applications
- Machine Learning
- Computer Vision or Image Processing Applications.
- Speech Recognitions

Python Basic Syntax

There is no use of curly braces or semicolon in Python programming language. It is English-like language.

```
1. def func():
2.         statement 1
3.         statement 2
4.         ……..……
5.         ……..……
6.          statement N
```

Python First Program

Unlike the other programming languages, Python provides the facility to execute the code using few lines. **For example** - Suppose we want to print the **"Hello World"** program in Java; it will take three lines to print it.

```
1. public class HelloWorld {
2.  public static void main(String[] args){
3. // Prints "Hello, World" to the terminal window.
4.  System.out.println("Hello World");
5.  }
6.  }
```

On the other hand, we can do this using one statement in Python.

```
1. print("Hello World")
```

Both programs will print the same result, but it takes only one statement without using a semicolon or curly braces in Python.

Python Data Types

Variables can hold values, and every value has a data-type. Python is a dynamically typed language; hence we do not need to define the type of the variable while declaring it. The interpreter implicitly binds the value with its type.

```
1. a = 5
```

The variable **a** holds integer value five and we did not define its type. Python interpreter will automatically interpret variables **a** as an integer type.

Consider the following example to define the values of different data types and checking its type.

```
1. a=10
2. b="Hi Python"
3. c = 10.5
4. print(type(a))
5. print(type(b))
6. print(type(c))
```

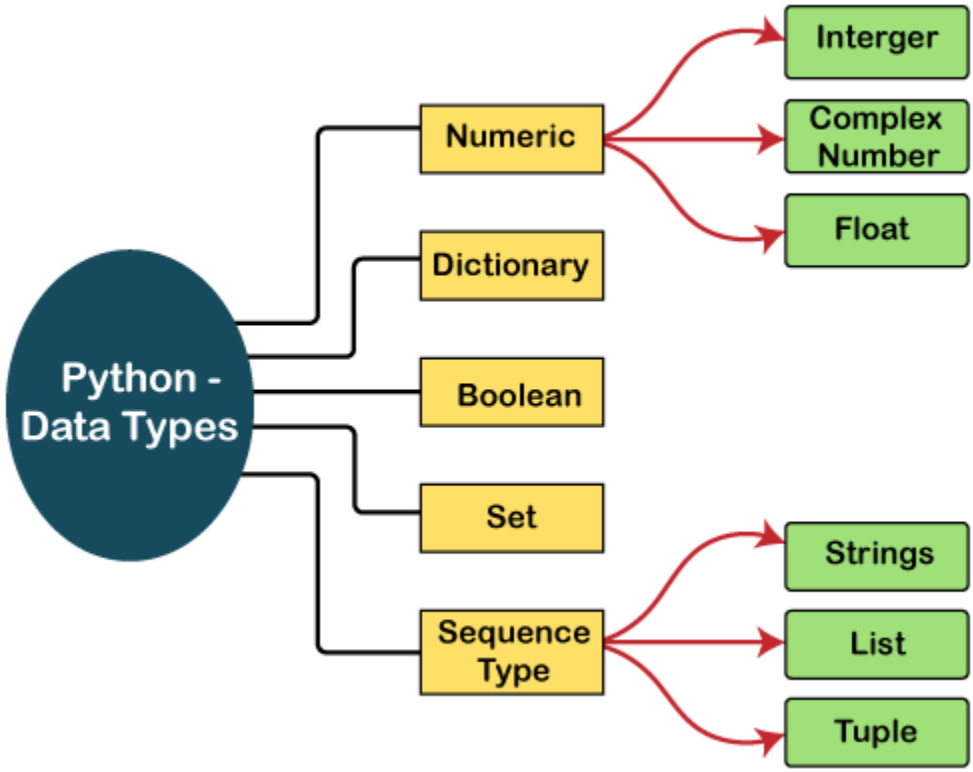
Output:

```
<type 'int'>
<type 'str'>
<type 'float'>
```

Standard data types

A variable can hold different types of values. For example, a person's name must be stored as a string whereas its id must be stored as an integer.
Python provides various standard data types that define the storage method on each of them. The data types defined in Python are given below.

1. Numbers
2. Sequence Type
3. Boolean
4. Set
5. Dictionary



Python Variables

Variable is a name that is used to refer to memory location. Python variable is also known as an identifier and used to hold value.

In Python, we don't need to specify the type of variable because Python is a infer language and smart enough to get variable type.

Variable names can be a group of both the letters and digits, but they have to begin with a letter or an underscore.

Declaring Variable and Assigning Values

Python does not bind us to declare a variable before using it in the application. It allows us to create a variable at the required time.

We don't need to declare explicitly variable in Python. When we assign any value to the variable, that variable is declared automatically.

Variable Names

We have already discussed how to declare the valid variable. Variable names can be any length can have uppercase, lowercase (A to Z, a to z), the digit (0-9), and underscore character(_). Consider the following example of valid variables names.

```
1. name = "Devansh"
2. age = 20
3. marks = 80.50
4.
5. print(name)
6. print(age)
7. print(marks)
```

Output:

```
Devansh
20
80.5
```

Python Variable Types

There are two types of variables in Python - Local variable and Global variable. Let's understand the following variables.

Local Variable

Local variables are the variables that declared inside the function and have scope within the function. Let's understand the following example.

Example -

```
1. # Declaring a function
2. def add():
3.     # Defining local variables. They has scope only within a function
4.     a = 20
5.     b = 30
```

```
    c = a + b
    print("The sum is:", c)

# Calling a function
add()
```

Output:

The sum is: 50

Global Variables

Global variables can be used throughout the program, and its scope is in the entire program. We can use global variables inside or outside the function.

A variable declared outside the function is the global variable by default. Python provides the **global** keyword to use global variable inside the function. If we don't use the **global** keyword, the function treats it as a local variable. Let's understand the following example.

Example -

```
# Declare a variable and initialize it
x = 101

# Global variable in function
def mainFunction():
    # printing a global variable
    global x
    print(x)
    # modifying a global variable
    x = 'Welcome To Javatpoint'
    print(x)

mainFunction()
print(x)
```

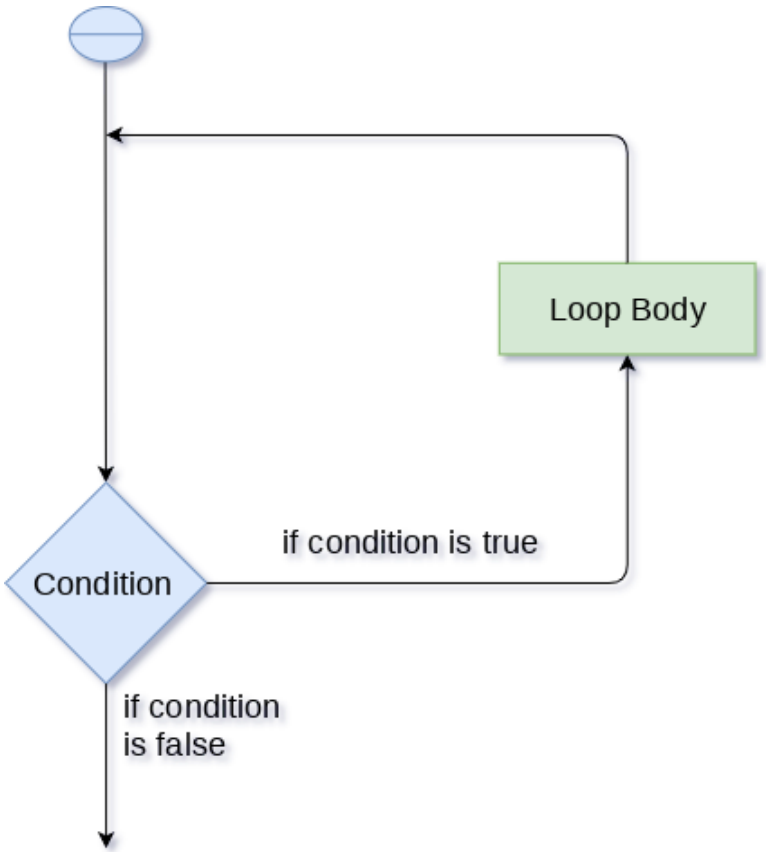
Output:

101
Welcome To Home
Welcome To Home

Python Loops

The flow of the programs written in any programming language is sequential by default. Sometimes we may need to alter the flow of the program. The execution of a specific code may need to be repeated several numbers of times.

For this purpose, The programming languages provide various types of loops which are capable of repeating some specific code several numbers of times. Consider the following diagram to understand the working of a loop statement.



Advantages of loops

There are the following advantages of loops in Python.

1. It provides code re-usability.
2. Using loops, we do not need to write the same code again and again.
3. Using loops, we can traverse over the elements of data structures (array or linked lists).

There are the following loop statements in Python.

Loop Statement	Description
for loop	The for loop is used in the case where we need to execute some part of the code until the given condition is satisfied. The for loop is also called as a per-tested loop. It is better to use for loop if the number of iteration is known in advance.
while loop	The while loop is to be used in the scenario where we don't know the number of iterations in advance. The block of statements is executed in the while loop until the condition specified in the while loop is satisfied. It is also called a pre-tested loop.
do-while loop	The do-while loop continues until a given condition satisfies. It is also called post tested loop. It is used when it is necessary to execute the loop at least once (mostly menu driven programs).

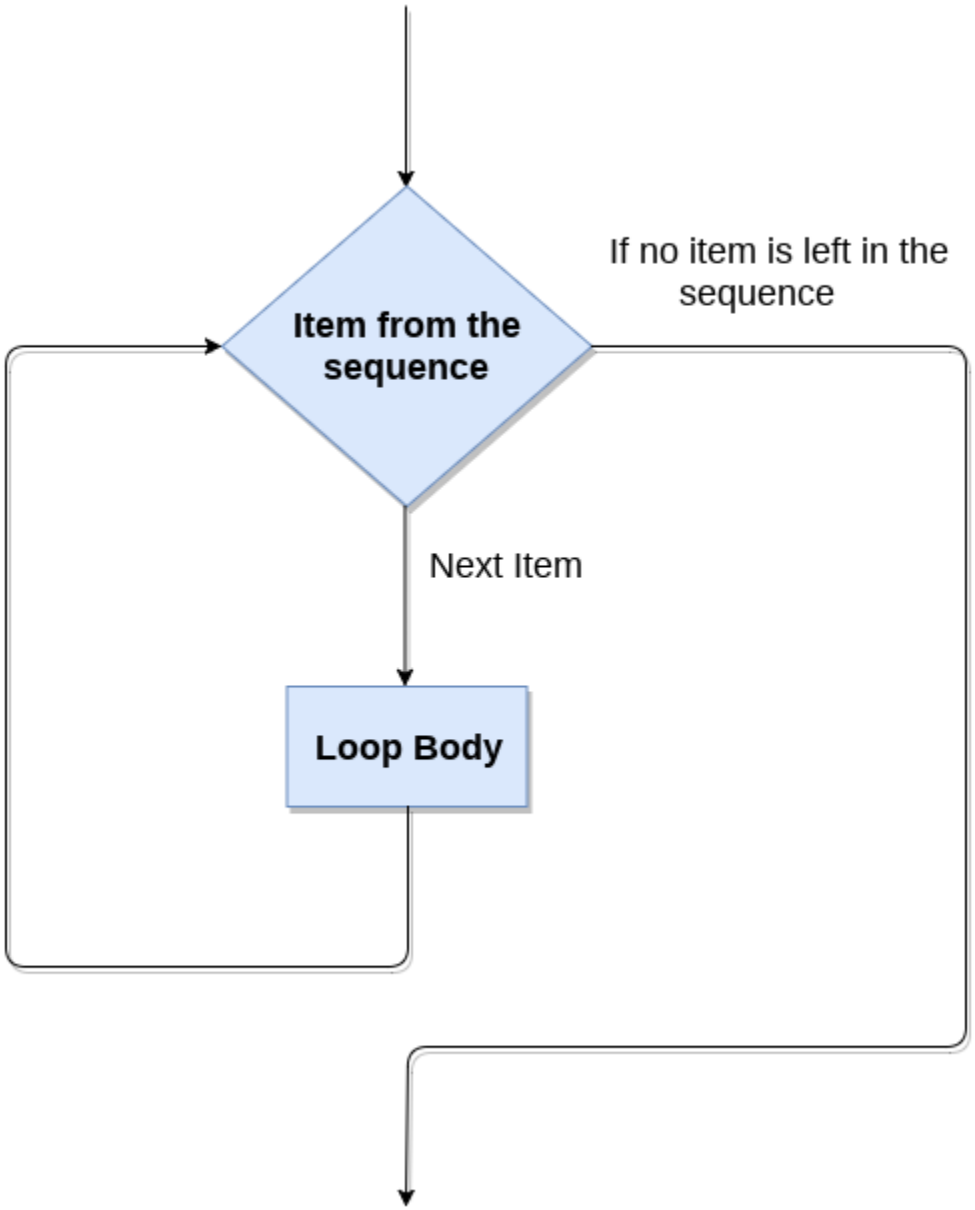
Python for loop

The for **loop in Python** is used to iterate the statements or a part of the program several times. It is frequently used to traverse the data structures like list, tuple, or dictionary.

The syntax of for loop in python is given below.

```
1. for iterating_var in sequence:
2.     statement(s)
```

The for loop flowchart



For loop Using Sequence

Example-1: Iterating string using for loop

```
1. str = "Python"
2. for i in str:
3.     print(i)
```

Output:

p
y
t
h
o
n

Python While loop

The Python while loop allows a part of the code to be executed until the given condition returns false. It is also known as a pre-tested loop.

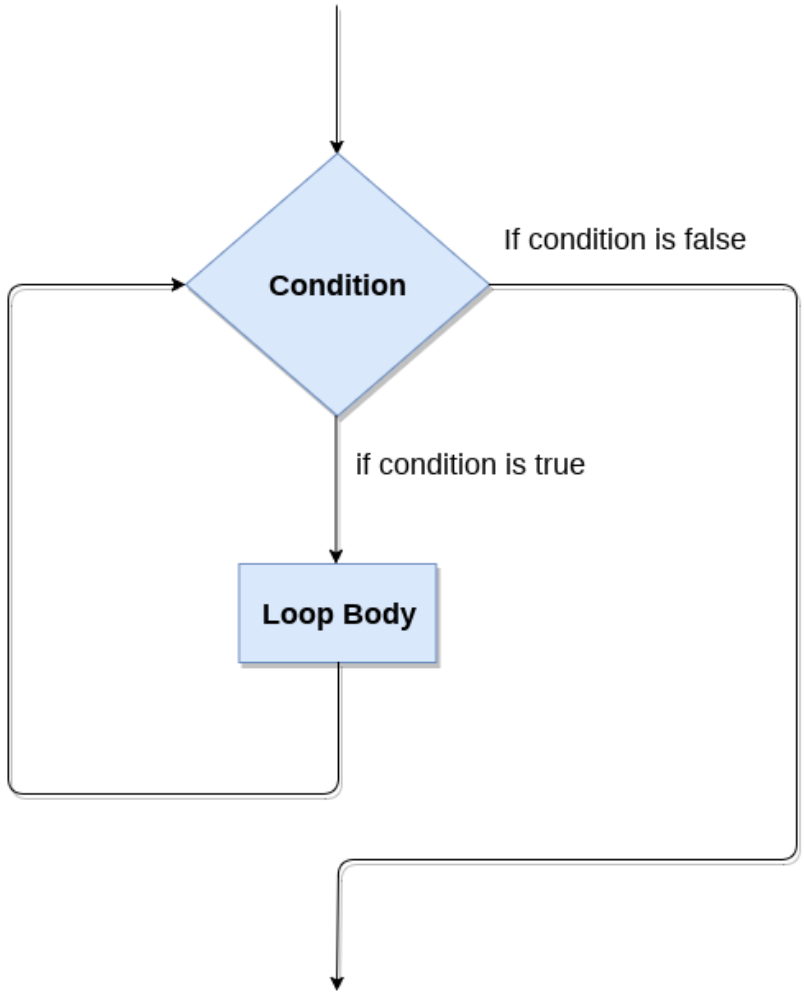
It can be viewed as a repeating if statement. When we don't know the number of iterations then the while loop is most effective to use.

The syntax is given below.

1. **while** expression:
2. statements

Here, the statements can be a single statement or a group of statements. The expression should be any valid Python expression resulting in true or false. The true is any non-zero value and false is 0.

While loop Flowchart



Example:

```
1. # prints all letters except 'a' and 't'
2. i = 0
3. str1 = 'javatpoint'
4.
5. while i < len(str1):
6.     if str1[i] == 'a' or str1[i] == 't':
7.         i += 1
8.         continue
9.     print('Current Letter :', a[i])
```

```
10.     i += 1
```

Output:

```
Current Letter: s
Current Letter: a
Current Letter: n
Current Letter: k
Current Letter: r
Current Letter: t
```

Python List

A list in Python is used to store the sequence of various types of data. Python lists are mutable type its mean we can modify its element after it created. However, Python consists of six data-types that are capable to store the sequences, but the most common and reliable type is the list.

A list can be defined as a collection of values or items of different types. The items in the list are separated with the comma (,) and enclosed with the square brackets [].

A list can be define as below

```
1.  L1 = ["John", 102, "USA"]
2.  L2 = [1, 2, 3, 4, 5, 6]
```

IIf we try to print the type of L1, L2, and L3 using type() function then it will come out to be a list.

```
1.  print(type(L1))
2.  print(type(L2))
```

Output:

```
<class 'list'>
<class 'list'>
```

Characteristics of Lists

The list has the following characteristics:

- The lists are ordered.
- The element of the list can access by index.
- The lists are the mutable type.
- The lists are mutable types.
- A list can store the number of various elements.

Python Dictionary

Python Dictionary is used to store the data in a key-value pair format. The dictionary is the data type in Python, which can simulate the real-life data arrangement where some specific value exists for some particular key. It is the mutable data-structure. The dictionary is defined into element Keys and values.

- Keys must be a single element
- Value can be any type such as list, tuple, integer, etc.

In other words, we can say that a dictionary is the collection of key-value pairs where the value can be any Python object. In contrast, the keys are the immutable Python object, i.e., Numbers, string, or tuple.

Creating the dictionary

The dictionary can be created by using multiple key-value pairs enclosed with the curly brackets {}, and each key is separated from its value by the colon (:).The syntax to define the dictionary is given below.

Syntax:

1. Dict = {"Name": "Tom", "Age": 22}

In the above dictionary **Dict**, The keys **Name** and **Age** are the string that is an immutable object.

Let's see an example to create a dictionary and print its content.

```
1. Employee = {"Name": "John", "Age": 29, "salary":25000,"Company":"GOOGLE"}
2. print(type(Employee))
3. print("printing Employee data .... ")
4. print(Employee)
```

Output

<class 'dict'>
Printing Employee data….
{'Name': 'John', 'Age':29, 'salary':25000, 'Company': 'GOOGLE',}

Python Function

Functions are the most important aspect of an application. A function can be defined as the organized block of reusable code, which can be called whenever required.

Python allows us to divide a large program into the basic building blocks known as a function. The function contains the set of programming statements enclosed by {}. A function can be called multiple times to provide reusability and modularity to the Python program.

There are mainly two types of functions.

- **User-define functions** - The user-defined functions are those define by the **user** to perform the specific task.
- **Built-in functions** - The built-in functions are those functions that are **pre-defined** in Python.

In this tutorial, we will discuss the user define functions.

Advantage of Functions in Python

There are the following advantages of Python functions.

- Using functions, we can avoid rewriting the same logic/code again and again in a program.
- We can call Python functions multiple times in a program and anywhere in a program.
- We can track a large Python program easily when it is divided into multiple functions.
- Reusability is the main achievement of Python functions.
- However, Function calling is always overhead in a Python program.

Creating a Function

Python provides the **def** keyword to define the function. The syntax of the define function is given below.

Syntax:

```
1. def my_function(parameters):
2.     function_block
3. return expression
```

Function Calling

In Python, after the function is created, we can call it from another function. A function must be defined before the function call; otherwise, the Python interpreter gives an error. To call the function, use the function name followed by the parentheses.

Consider the following example of a simple example that prints the message "Hello World".

```
1. #function definition
2. def hello_world():
3.     print("hello world")
4. # function calling
5. hello_world()
```

Output:

```
hello world
```