



Lecture slides - Week 2

Introduction to Python

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Introduction

What is Python?























- Python is a widely used **high-level** programming language created by *Guido van Rossum* in the late 1980s. The language places strong emphasis on *code readability and simplicity*, making it possible for programmers to develop applications rapidly.
- Like other programming languages, a Python program is just a sequence of instructions telling a computer what to do.
- Python is one example of a programming language. You may have heard of some other languages, such as C++, Java, Perl, C-Sharp, or BASIC.
- All of the languages mentioned above are examples of *high-level* computer languages. Although they are precise, they are designed to be used and understood by humans. Strictly speaking, computer hardware can only understand very low-level language known as *machine language*.

Why are we using Python?

If you are new to programming, Python is a great place to start. One of the key features of Python is its simplicity, making it the ideal language for beginners to learn. Also, Python is the most-frequently-taught first language at universities now.

The Top Programming Languages 2019 - IEEE Spectrum

Python has grabbed the first position in the list, making it the most popular programming language in 2019. Many popular platforms and software like YouTube, Reddit, Instagram, and Spotify are written in Python.

Language Rank	Types	Spectrum Ranking
1. Python	  	100.0
2. C++	  	99.7
3. Java	  	97.5
4. C	  	96.7
5. C#	  	89.4
6. PHP		84.9
7. R		82.9
8. JavaScript	 	82.6
9. Go	 	76.4
10. Assembly		74.1

Python Variables and Operators

What are variables?

Variables are names given to data that we need to store and manipulate in our programs. For instance, suppose your program needs to store the age of a user. To do that, we can name this data *userAge* and define the variable *userAge* using the following statement.

```
userAge = 0
```

Note that the = sign in the statement *userAge* = 0 has a different meaning from the = sign we learned in Math. In programming, the = sign is known as an **assignment sign**. It means we are assigning the value on the right side of the = sign to the variable on the left.

What are operators?

Operators are used to perform operations on variables and values. Besides assigning a variable an initial value, we can also perform the usual mathematical operations on variables. Basic Arithmetic operators in Python include $+$, $-$, $/$, and $*$ which represent addition, subtraction, division and multiplication respectively.

Example:

Suppose $x = 5, y = 2$

Addition: $x + y = 7$

Subtraction: $x - y = 3$

Multiplication: $x * y = 10$

Division: $x/y = 2.5$

Data Types in Python

Integers

Integers are numbers with no decimal parts, such as -5, -4, -3, 0, 5, 7 etc.

To declare an integer in Python, simply write `variableName = initial value`

Example:

```
userAge = 20, mobileNumber = 12398724
```

Float refers to numbers that have decimal parts, such as 1.234, -0.023, 12.01.

To declare a float in Python, we write `variableName = initial value`

Example:

userHeight = 1.82, userWeight = 67.2

- String refers to text.
- To declare a string, you can either use `variableName = 'initial value'` (single quotes) or `variableName = "initial value"` (double quotes)
- **Example:** `userName = 'Peter'`, `userSpouseName = "Janet"`, `userAge = '30'`
- In the last example, because we wrote `userAge = '30'`, `userAge` is a string. In contrast, if you wrote `userAge = 30` (without quotes), `userAge` is an integer.
- We can combine multiple substrings by using the concatenate sign (+). For instance, `"Peter" + "Lee"` is equivalent to the string `"PeterLee"`.

String Formation

Formatting Strings using the % Operator

Strings can also be formatted using the % operator. The syntax for using the % operator is

```
"string to be formatted" %(values or variables to be  
inserted into string, separated by commas)
```

There are three parts to this syntax. First we write the string to be formatted in quotes. Next we write the % symbol. Finally, we have a pair of round brackets () within which we write the values or variables to be inserted into the string. This round brackets with values inside is actually known as a tuple. For example:

```
brand = "HP"  
price = 55000.57  
print ("The price of this %s laptop is %f PKR" %(brand, price))
```

Formatting Strings using the format() method

In addition to using the % operator to format strings, Python also provides us with the format() method to format strings. The syntax is

```
"string to be formatted".format(values or variables to  
be inserted into string, separated by commas)
```

When we use the format method, we do not use argument specifiers such as %s, %f or %d. Instead we use curly brackets.

Example:

```
brand = "HP"
```

```
price = 55000.57
```

```
print ("The price of this {0} laptop is {1} PKR".format(brand,  
price))
```


Formatting Strings using f-strings in Python 3

In addition to using the % operator to format strings, Python also provides us with f-strings (formatted string literals) to format strings. The syntax is as follows:

```
f"string to be formatted {values or variables to be inserted  
into string}"
```

With f-strings, we can directly embed variables and expressions within the string using curly braces.

Example:

```
brand = "HP"  
price = 55000.57
```

```
print(f"The price of this {brand} laptop is {price} PKR")
```

Type Casting in Python

What is type casting?

- Sometimes in our program, it is necessary for us to convert from one data type to another, such as from an integer to a string. This is known as type casting.
- There are three built-in functions in Python that allow us to do type casting. These are the **int()**, **float()**, and **str()** functions.

Using `int()`

The **`int()`** function in Python takes in a float or an appropriate string and converts it to an integer.

To change a float to an integer, we can type **`int(5.712987)`**. We'll get 5 as a result (anything after the decimal point is removed).

To change a string to an integer, we can type **`int("4")`** and we'll get 4.

However, we cannot type **`int ("Hello")`** or **`int ("4.22321")`**. We'll get an error in both cases.

Using float()

The **float()** function takes in an integer or an appropriate string and changes it to a float.

For instance, if we type **float(2)** or **float("2")**, we'll get 2.0.

If we type **float("2.09109")**, we'll get 2.09109 which is a float and not a string since the quotation marks are removed.

Using `str()`

The **`str()`** function on the other hand converts an integer or a float to a string.

For instance, if we type **`str(2.1)`**, we'll get "2.1".

Book Reference

Where to find these topics?

The materials covered in these slides are from the book **“Learn Python in one Day”** - pages 1 to 32.

[click here to access the book](#)