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Reaching end to end

Introducing Python

by

python™

Umair bin Mansoor
Network Programming Planner

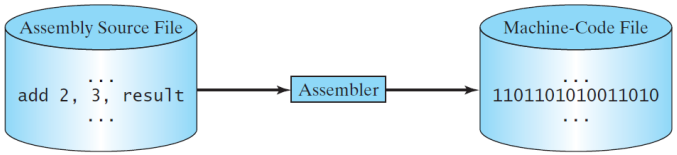
OBJECTIVES

After this session, students will be able to:

- **Describe the history of Python.**
- **Explain the basic syntax of a Python program.**
- **Write and run a simple Python program.**
- **Explain the importance of, and provide examples of, proper programming style and documentation.**
- **Explain the difference between syntax errors, runtime errors, and logical errors.**

PROGRAMMING LANGUAGES

- Computers do not understand human languages.



- A computer only understands it's native language called the Machine language.
  - The machine language is how humans talk to a computer. It is in 0's and 1's.
  - To add two numbers you should have a unique pattern of 0's and 1's.
  - It is difficult for the humans to write programs in machine language.

- Assembly language was created as an alternative to machine language.
  - It contains short descriptive words known as mnemonics.
  - Each mnemonic word represent a bit pattern of 0's and 1's.
  - An assembler is used to convert the assembly language to machine language.

Assembly language code ⟶ add 2, 3, result

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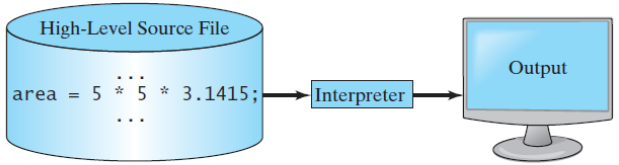
PROGRAMMING LANGUAGES

- In 1950s, a new generation of programming languages emerged.
- They were known as high-level-languages because humans can understand it.
- They were independent of the underlying platform/machine/computer.
- A program written in high-level-language is called a source code.
- The source code is translated to the machine code by an interpreter or a complier.
- A high-level code line is called a statement:
  area = 5 * 5 * 3.1415
- An interpreter right away translates and executes line-by-line from source to machine code.
- A compiler translates the entire source code into a machine code and then executes it.



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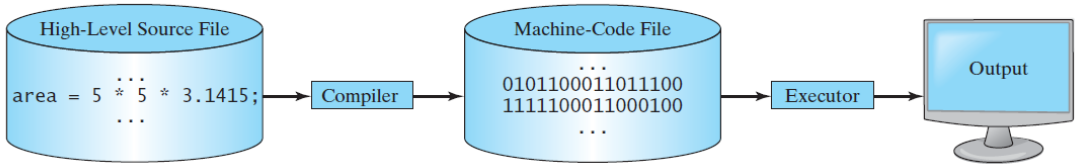

HISTORY OF PYTHON

- Python was created by Guido van Rossum in the Netherlands in 1990 and was named after the popular British comedy troupe *Monty Python's Flying Circus.*
- Python is a general purpose programming language. You can write code in it for any programming task.
- It is currently being used by Google search engine, in mission-critical projects at NASA, and in the transaction processing at the New York Stock Exchange.
- Python is interpreted, as it executes statements line-by-line.
- Python is an Object-Oriented Programming (OOP) language. OOP is a powerful tool for developing reusable software.
- Two versions of Python are currently coexistent: Python 2 and Python 3. Python 3 is not backward-compatible. Python 2 will eventually be replaced by Python 3.

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PYTHON Installation

- **Python installation:**
  - https://www.anaconda.com/distribution/
  - https://www.python.org/downloads/

ANACONDA.

- **GitHub**
  - https://github.com/umairbinmansoor/Python_training_2019

PYTHON programming basics

Welcome.py

```
1. # Display two messages
2. print("Welcome to Python")
3. Print("Python is fun"),
```

- **Syntax Errors**
  - **Indentation matters in Python. All code segments must have the same distance from the start. (line 2)**
  - **Unwanted punctuations after the curly braces. (line 2 and 3)**
  - **Python key words are case sensitive: the *print* keyword starts with a small p and not with a capital P. (line 3)**

PYTHON programming basics

- **Runtime Errors**
  - **They occur when the program is running**
  - **Wrong input type, e.g. string in place of an integer**
  - **Division by zero**
  - **In python some of the runtime errors are caught by the interpreter**

- **Logical Errors**
  - **They occur with human error**
  - **Wrong formula** (see *ShowLogicErrors.py* on Github)
  - **Challenging to find logical errors**

PYTHON programming basics

Welcome.py

```
1. # Display two messages
2. print("Welcome to Python")
3. print("Python is fun")
```

- **Commenting**
  - **Single line**
    - **# symbol is used to comment a single line in Python**
  - **Paragraph/multi-line**
    - ***""""" Whatever is written here and how long the para is it will be commented out """""***

PYTHON programming basics

ComputeExpression.py

```
1. # Compute expression
2. print((10.5 + 2 * 3) / (45 - 3.5))
```

$$\left\{\frac{10.5 + 2 \times 3}{45 - 3.5}\right\}$$

- **Mathematical Computations**
  - `print(x + y)`
  - `print(x - y)`
  - `print(x * y)`
  - `print(x / y)`

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PYTHON programming exercises

1. Write a program that displays the result of $\left\{\frac{9.5 \times 4.5 - 2.5 \times 3}{45.5 - 3.5}\right\}$
2. Write a program that displays the area and perimeter of a circle that has a radius of 5.5 using the following formulas:
   1. Area = radius x radius x π
   2. Perimeter = 2 x radius x π
3. Assume a runner runs 14 kilometers in 45 minutes and 30 seconds. Write a program that displays the average speed in miles per hour. (1 mile = 1.6 km)
4. Find the error in *ShowLogicError.py* and explain the type of error.

Questions & Answers