Python Programming Language

Prepared by: Mohamed Ayman

Algorithm Engineer at Valeo

Deep Learning Researcher and Teaching Assistant

at The American University in Cairo (AUC)

spring 2020

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codeforces.com/profile/Mohamed_Ayman

Mohamed Ayman

Experience

- Valeo [2019-Present]
  - Deep Learning Researcher
  - Algorithm Software Engineer
- The American University in Cairo (AUC) [2019-Present]
  - Research Assistant
  - Teaching Assistant
- BBI Consultancy [2016-2019]
  - Research and Development Engineer (R&D Engineer)
  - Data Engineer

Education

- MSc in Deep Learning, Cairo University [2018-2021]
- BSc in Computer Science, Cairo University [2013-2017]

Python Programming Language Training

Lecture Agenda

We will discuss in this lecture the following topics

1- Python Features

2- Python Content

3- Practice on Online Judges

4- Tutorials and References

5- Online Courses

6- Python Installation

Let's
START UP

Lecture Agenda

- ✔ Section 1: Python Features
- Section 2: Python Content
- Section 3: Practice on Online Judges
- Section 4: Tutorials and References
- Section 5: Online Courses
- Section 6: Python Installation

Python Features

1. **A simple language which is easier to learn**
   Python has a very simple and elegant syntax. It's much easier to read and write Python programs compared to other languages like: C++, Java, C#. Python makes programming fun and allows you to focus on the solution rather than syntax.
   If you are a newbie, it's a great choice to start your journey with Python.

2. **Free and open-source**
   You can freely use and distribute Python, even for commercial use. Not only can you use and distribute softwares written in it, you can even make changes to the Python's source code.
   Python has a large community constantly improving it in each iteration.

3. **Portability**
   You can move Python programs from one platform to another, and run it without any changes.
   It runs seamlessly on almost all platforms including Windows, Mac OS X and Linux.

Python Features

4 **A high-level, interpreted language**

Unlike C/C++, you don't have to worry about daunting tasks like memory management, garbage collection and so on.

Likewise, when you run Python code, it automatically converts your code to the language your computer understands. You don't need to worry about any lower-level operations.

5 **Large standard libraries to solve common tasks**

Python has a number of standard libraries which makes life of a programmer much easier since you don't have to write all the code yourself. For example: Need to connect MySQL database on a Web server? You can use MySQLdb library using `import MySQLdb` .

Standard libraries in Python are well tested and used by hundreds of people. So you can be sure that it won't break your application.

6 **Object-oriented**

Everything in Python is an object. Object oriented programming (OOP) helps you solve a complex problem intuitively.

With OOP, you are able to divide these complex problems into smaller sets by creating objects.

Python Features

- Simple & Easy to Learn

Java

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, world");
    }
}
```

Python

```
print("Hello, world")
```

Python Features

- Portable & Extensible

Python Features

- Testing Frameworks

  - Python supports testing with cross-platform & cross-browser
  - Built in testing framework which covers debugging time and fastest workflows

Tools

Framework

Splinter

pytest

Python Features

- Web Development

- Develop web applications
- Scrape websites

Frameworks

django | Flask | Pylons | WEB2PY

Python Features

- Computer Graphics

➢ Graphical User Interface ➢ Desktop applications ➢ Game development

Libraries

Tkinter Jython wxPython pygame

Python Features

- Data Science

- Well-suited for data manipulation & analysis
- Deals with tabular data with heterogeneously-typed columns
- Arbitrary matrix data
- Observational/ statistical datasets

Libraries

NumPy

Pandas

matplotlib

seaborn

Python Features

- Big Data

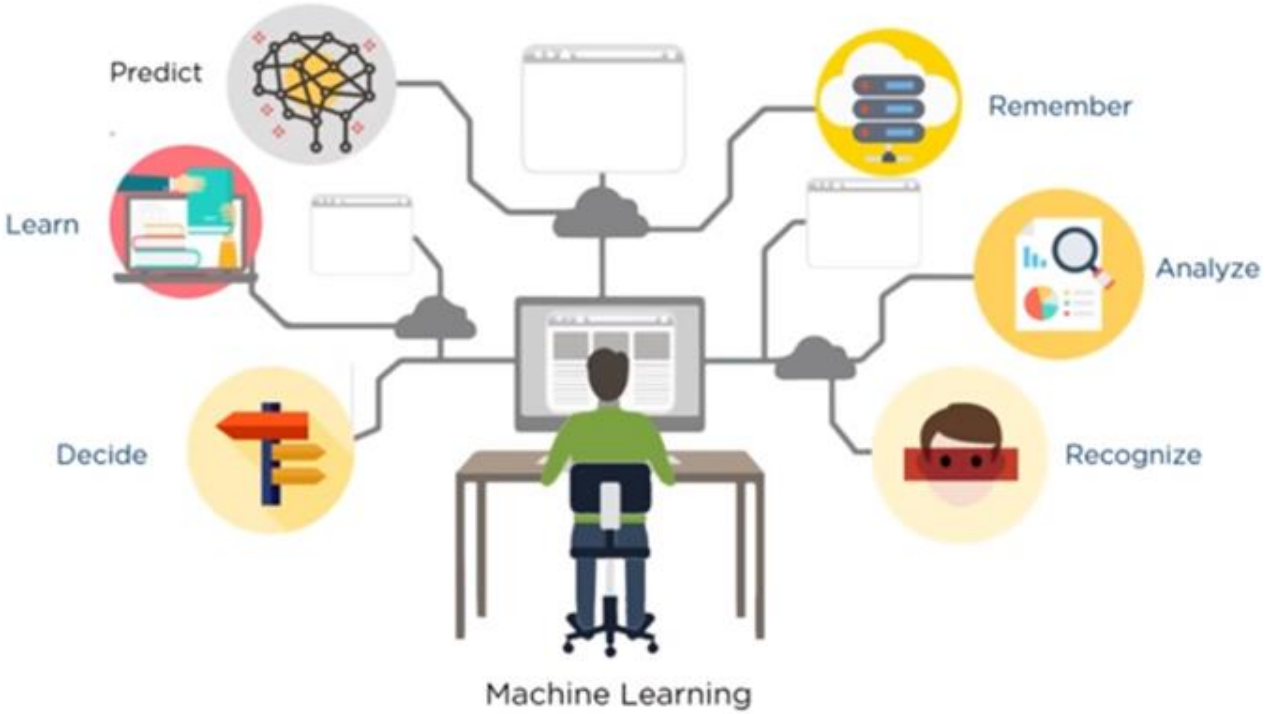
  - Python handles **BIG DATA!**
  - Python supports parallel computing
  - You can write MapReduce codes in Python

Libraries

PYDOOP | DASK | PySpark

Python Features

- Artificial Intelligence



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Python Content

Part 1: Python Basics and Functions

Lecture 1: Python Overview

Lecture 2: Variable Types

Lecture 3: Basic Operations

Lecture 4: Conditions

Lecture 5: Loops

Lecture 6: Functions

Part 2: Python Collections and Strings

Lecture 7: Strings

Lecture 8: Lists

Lecture 9: Tuples

Lecture 10: Dictionaries

Lecture 11: Sets

Lecture 12: Numbers

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Python Content

Part 3: Python Object Oriented

Lecture 13: Object Oriented Overview

Lecture 14: Data Encapsulation

Lecture 15: Operator Overloading

Function Overloading

Lecture 16: Inheritance

Function Overriding

Lecture 17: Polymorphism

Abstract Class

Part 4: Python Files and Standard Libraries

Lecture 18: Modules

Standard Libraries

Lecture 19: File Handling

Lecture 20: Exception Handling

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Hands-on Projects & Practices

Python Basics Projects (4 Projects)

- Project 1: Tic-Tac-Toe Game (python basics application)
- Project 2: Connect Four Game (python basics application)
- Project 3: Sudoku Game (python basics application)
- Project 4: 2048 Game (python basics application)

Python Object Oriented Projects (4 Projects)

- Project 1: Advanced Mathematical Calculator (python object oriented application)
- Project 2: Library Management System (python object oriented application)
- Project 3: Bank Management System (python object oriented application)
- Project 4: Project Management System (python object oriented application)

Python Practices (30+ Practice Problems) on each Lecture

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Practice on Online Judges

codeforces.com

hackerearth.com

hackerrank.com

atcoder.jp

Codeforces Online Judge

Codeforces is a website that hosts competitive programming contests. It is maintained by a group of competitive programmers from ITMO University led by Mikhail Mirzayanov.

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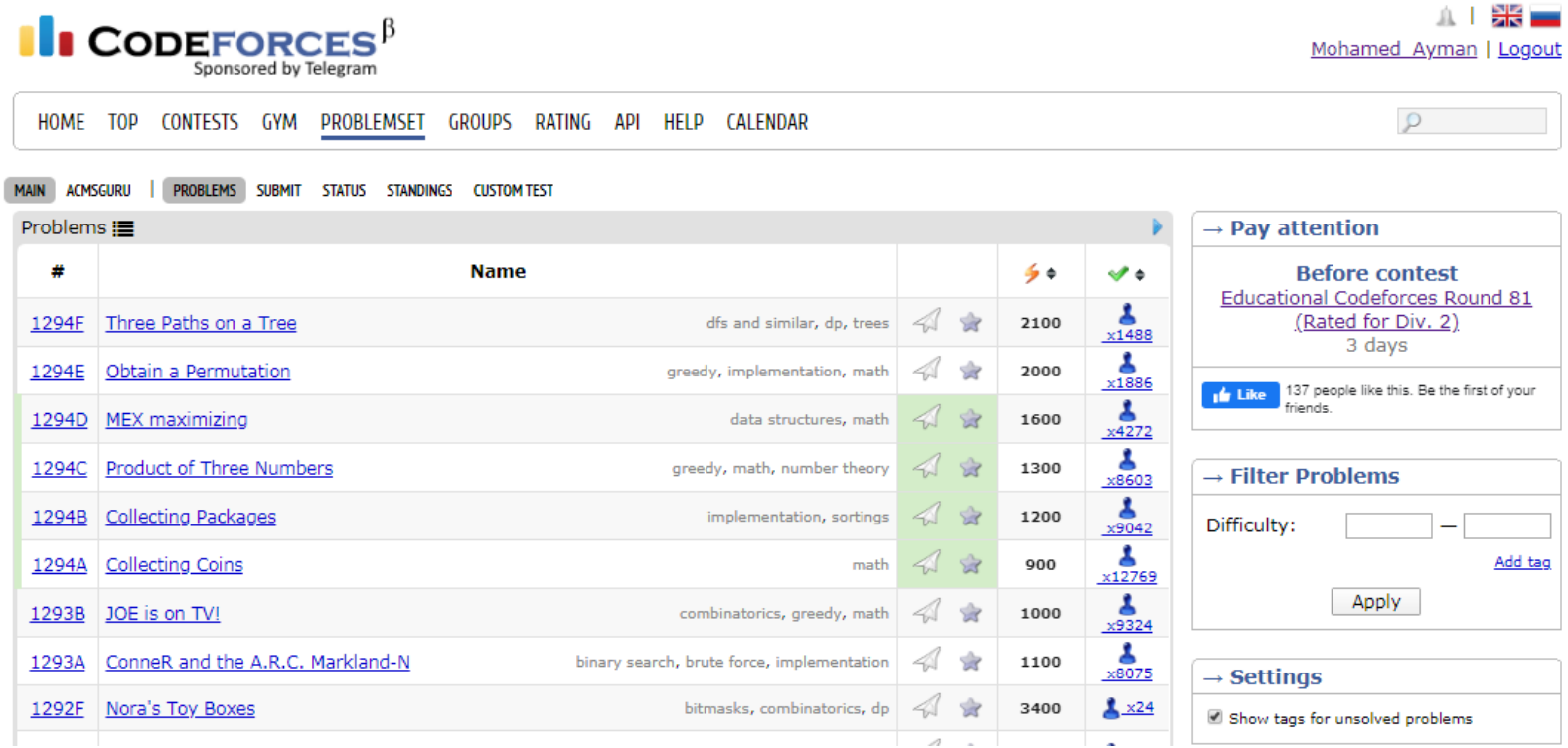
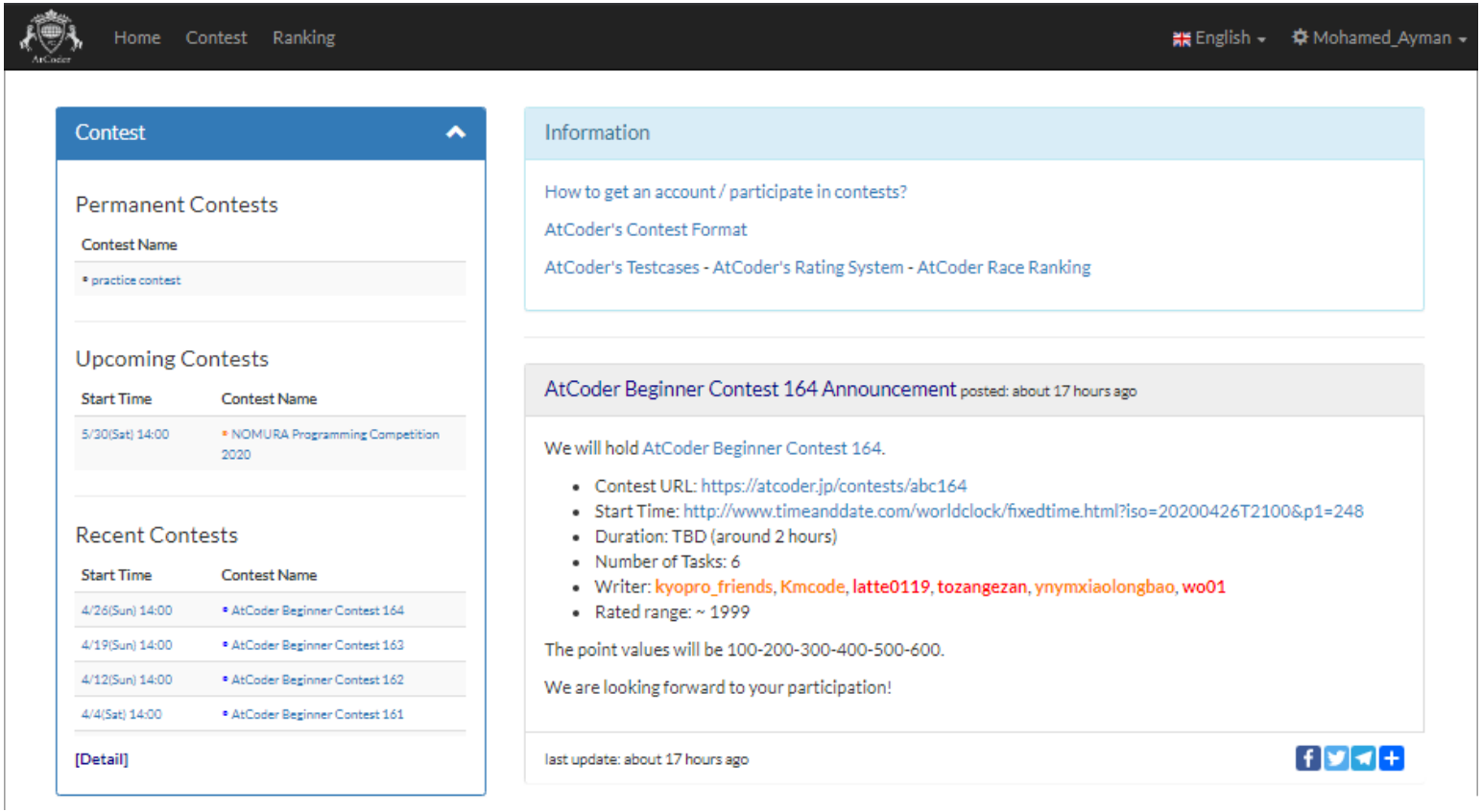
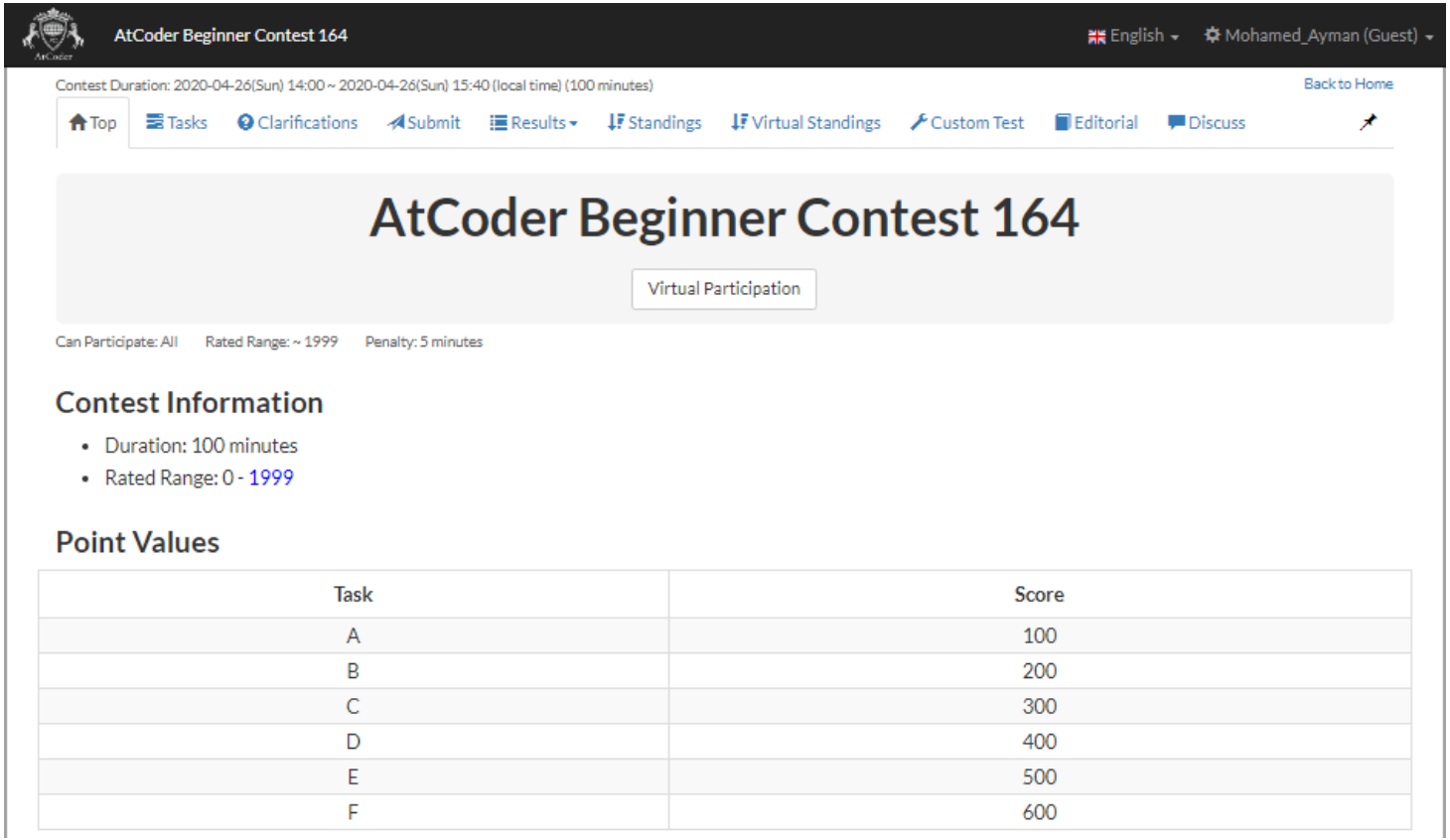
Codeforces Online Judge



AtCoder - Online Judge



AtCoder - Online Judge



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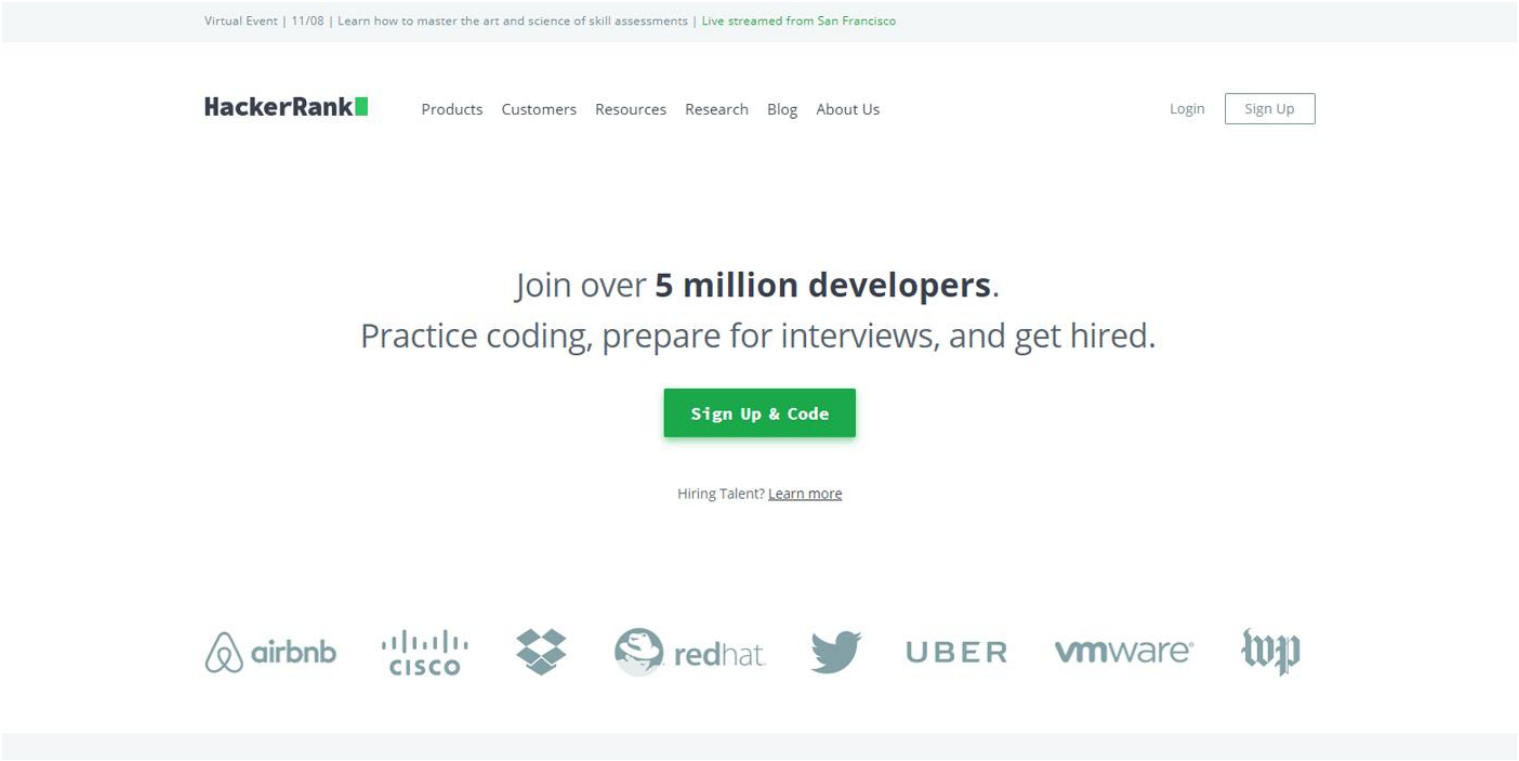
HackerRank - Online Judge



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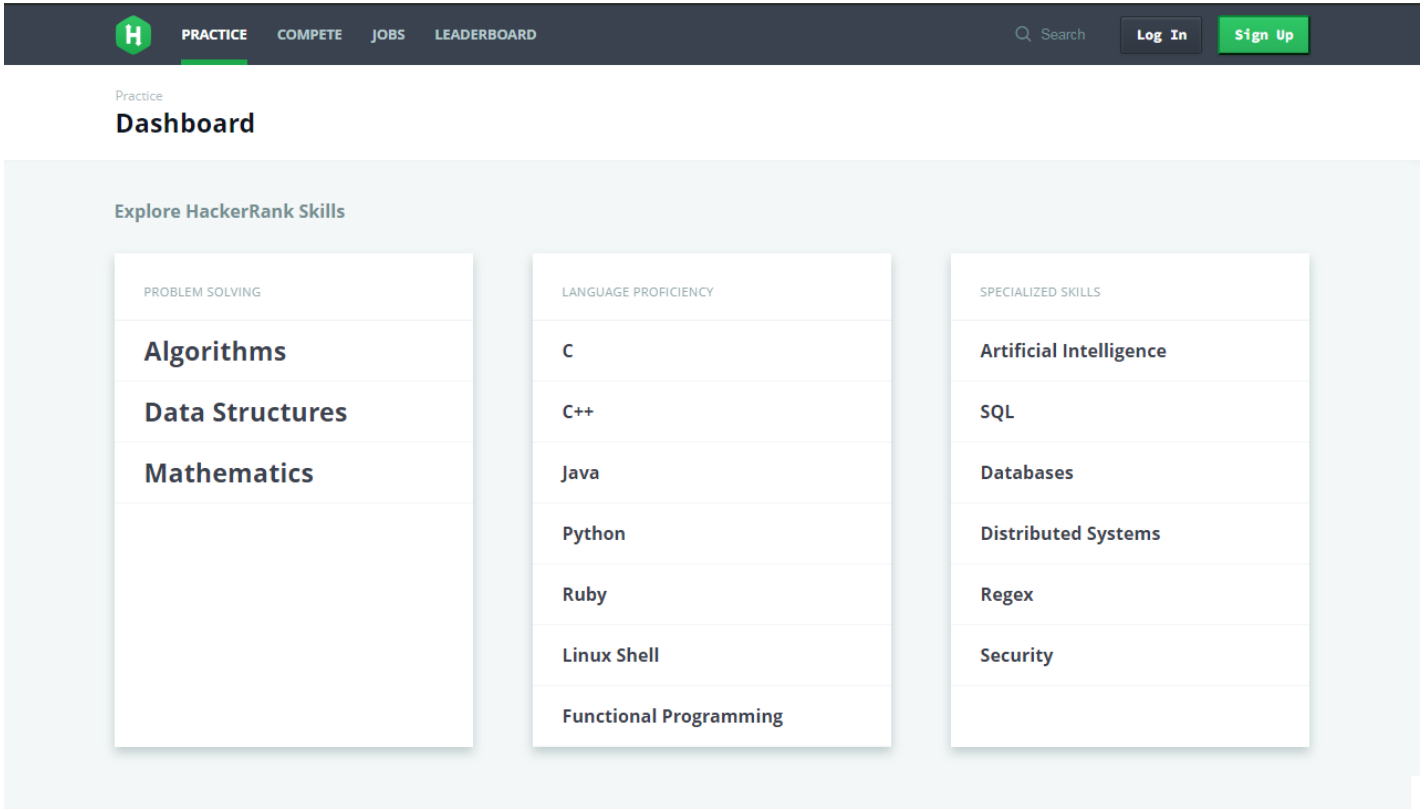
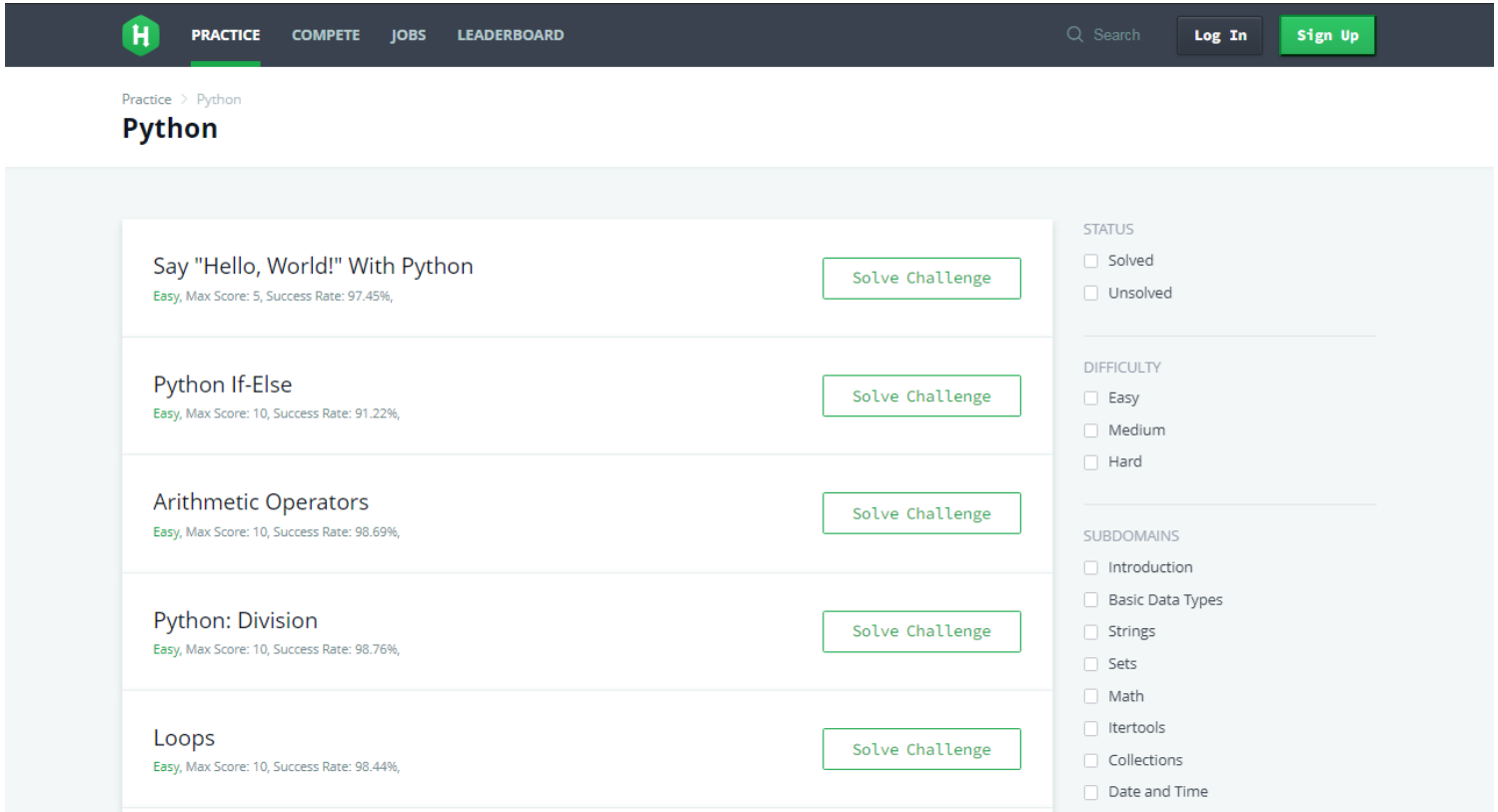
HackerRank - Online Judge



HackerRank - Online Judge



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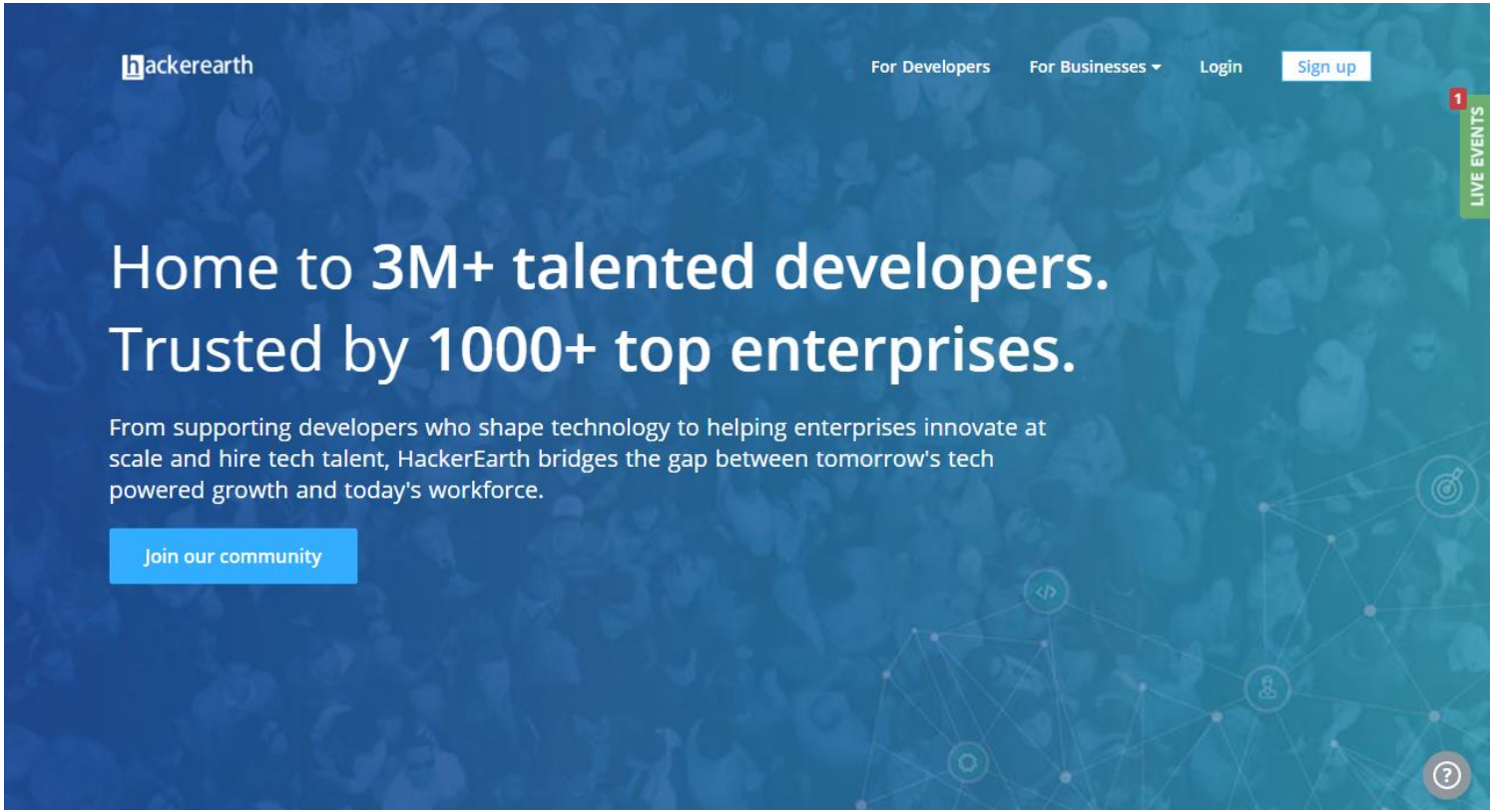
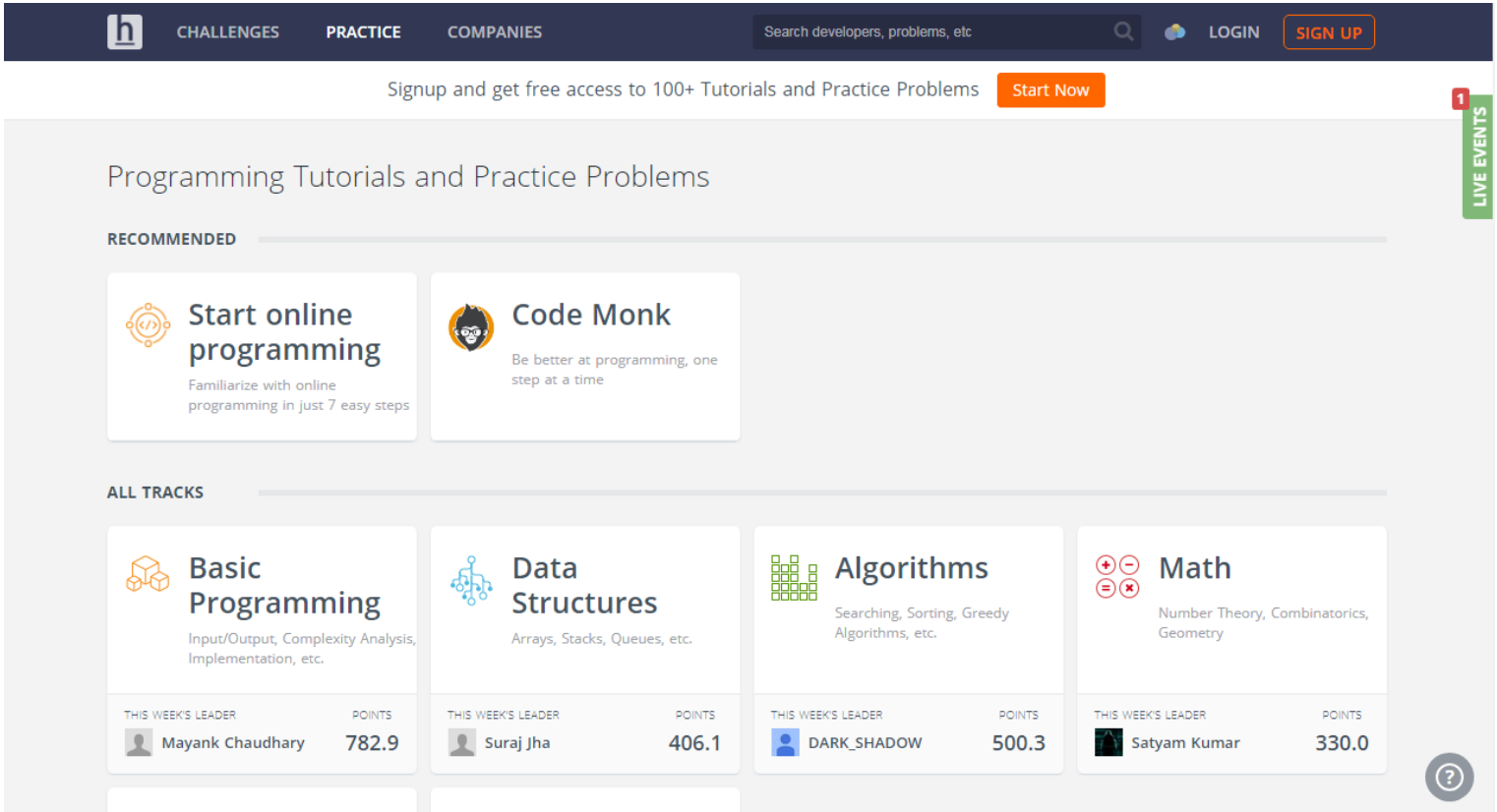
HackerEarth - Online Judge



HackerEarth - Online Judge



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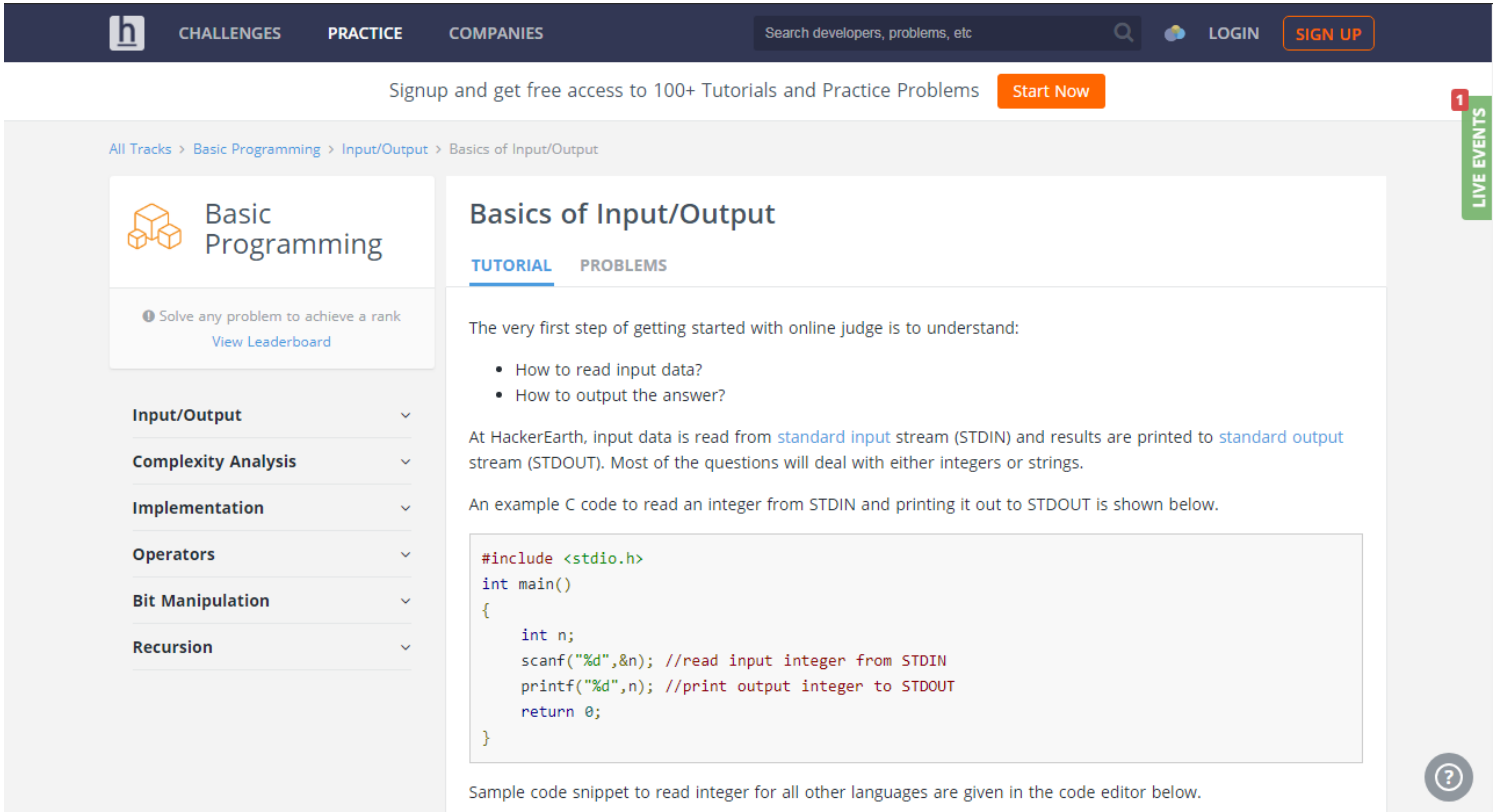
HackerEarth - Online Judge



Lecture Agenda

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Python Tutorials

programiz.com/python-programming

docs.python.org/3

geeksforgeeks.org/python-programming-language

tutorialspoint.com/python3

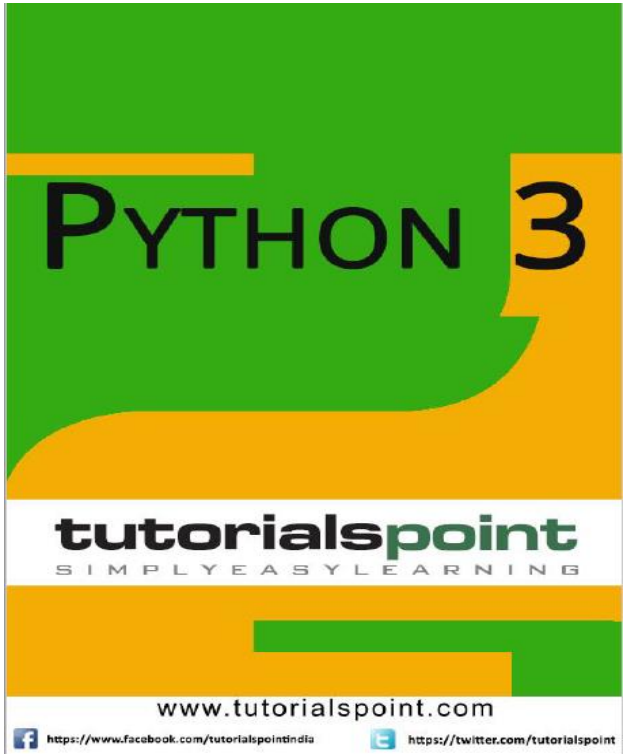
Python 3 TutorialsPoint

- PYTHON 3 - BASIC TUTORIAL [001 - 330]

- Python 3 - What is New?
- Environment Setup
- Variable Types
- Decision Making
- Numbers
- Lists
- Dictionary
- Functions
- Files I/O
- Overview
- Basic Syntax
- Basic Operators
- Loops
- Strings
- Tuples
- Date & Time
- Modules
- Exceptions Handling

- PYTHON 3 - ADVANCED TUTORIAL [330 - 500]

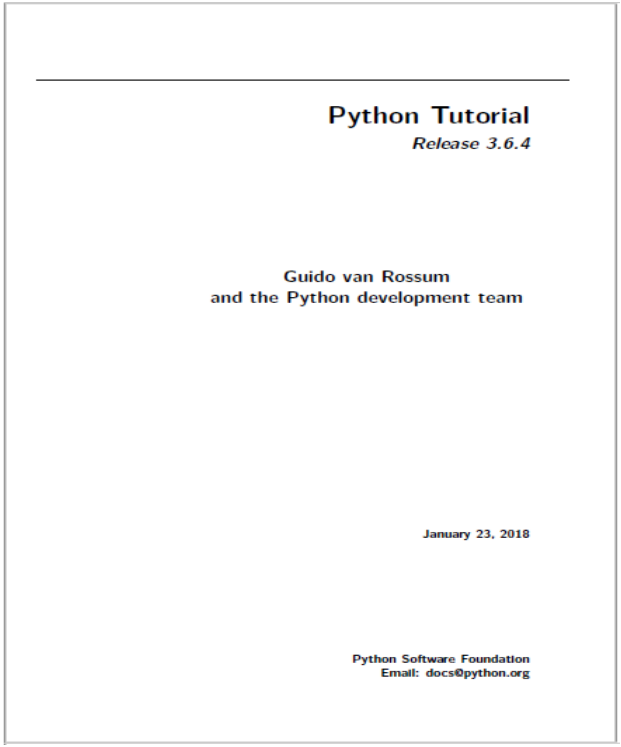
- Object Oriented
- CGI Programming
- Multithreaded Programming
- GUI Programming
- Regular Expressions
- MySQL Database Access
- XML Processing
- Extension Programming with C



Python 3 TutorialsPoint

Python Tutorial, Guido van Rossum

- Using the Python Interpreter [005 - 010]
- An Informal Introduction to Python [010 - 020]
- More Control Flow Tools [020 - 030]
- Data Structures [030 - 040]
- Modules [040 - 050]
- Input and Output [050 - 055]
- Errors and Exceptions [060 - 065]
- Classes [065 - 080]
- Brief Tour of the Standard Library [080 - 095]
- Virtual Environments and Packages [095 - 100]


Python Tutorial
Release 3.6.4

Guido van Rossum
and the Python development team

January 23, 2018

Python Software Foundation
Email: docs@python.org

Python Tutorial, Guido van Rossum

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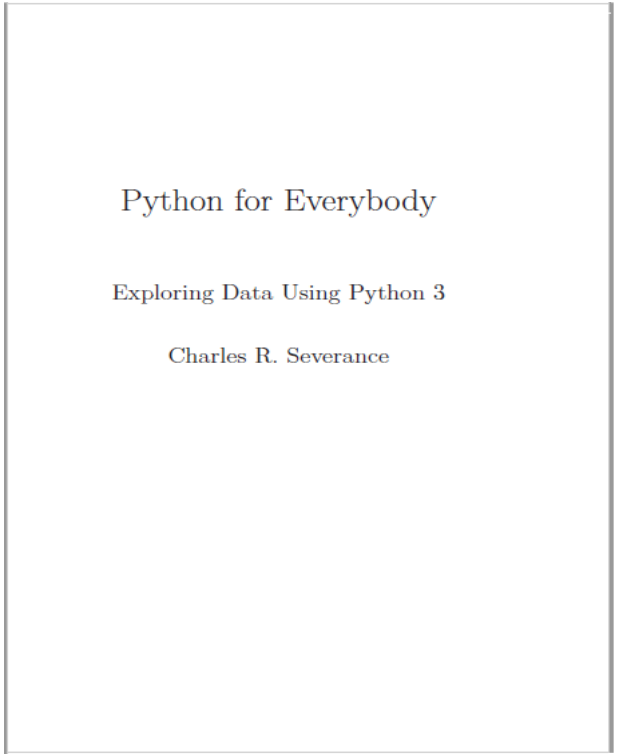
Python for Everybody, Charles R. Severance

- Why should you learn to write programs? [001 - 015]
- Variables, expressions, and statements [020 - 030]
- Conditional execution [030 - 040]
- Functions [040 - 055]
- Iteration [055 - 065]
- Strings [065 - 075]
- Files [080 - 090]
- Lists [090 - 105]
- Dictionaries [105 - 115]
- Tuples [115 - 125]
- Regular expressions [125 - 140]
- Object-oriented programming [170 - 185]
- Using Databases and SQL [185 - 210]



Python for Everybody, Charles R. Severance

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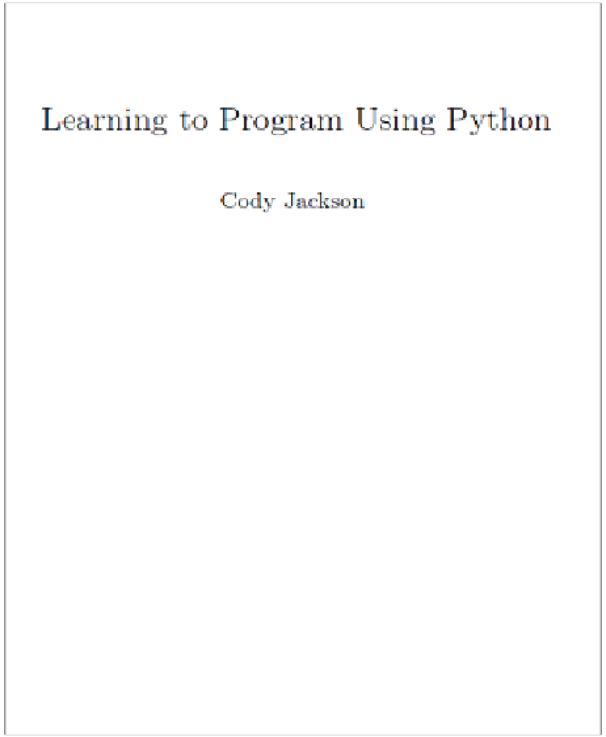
Learning to Program Using Python, Cody Jackson

- Introduction [010 - 015]
- How is Python Different? [015 - 020]
- Comparison of Programming Languages [020 - 030]
- The Python Interpreter [030 - 035]
- Types and Operators [035 - 040]
- Strings [040 - 050]
- Lists [050 - 055]
- Dictionaries [055 - 060]
- Tuples [060 - 070]
- Files [070 - 075]
- Statements [075 - 090]
- Making a Program [100 - 105]
- Exceptions [105 - 110]
- Object Oriented Programming [110 - 125]
- Databases [125 - 135]



Learning to Program Using Python, Cody Jackson

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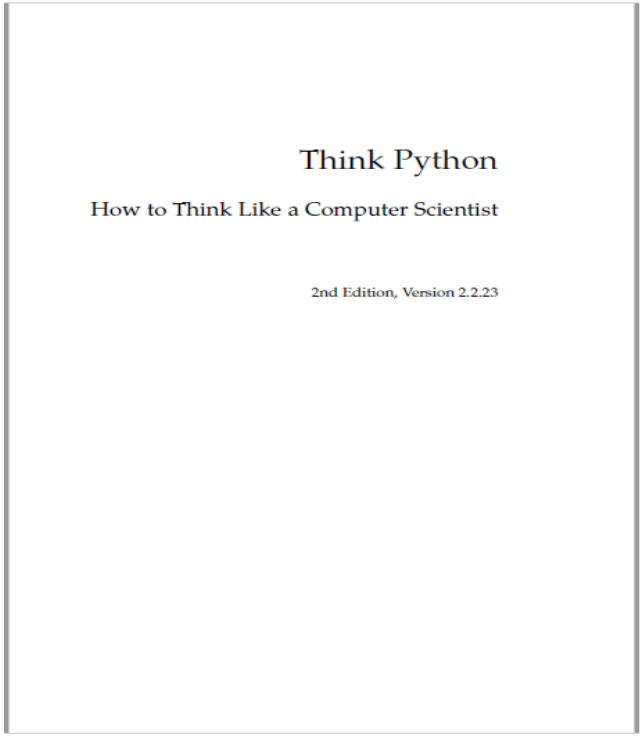
Think Python, Allen B. Downey

- The way of the program [001 - 010]
- Variables, expressions and statements [010 - 015]
- Functions [015 - 025]
- Conditionals and recursion [040 - 050]
- Fruitful functions [050 - 060]
- Iteration [060 - 070]
- Strings [070 - 080]
- Lists [090 - 100]
- Dictionaries [100 - 110]
- Tuples [110 - 120]
- Files [135 - 145]
- Classes and objects [145 - 155]
- Classes and functions [155 - 160]
- Classes and methods [160 - 170]
- Inheritance [170 - 180]



Think Python, Allen B. Downey

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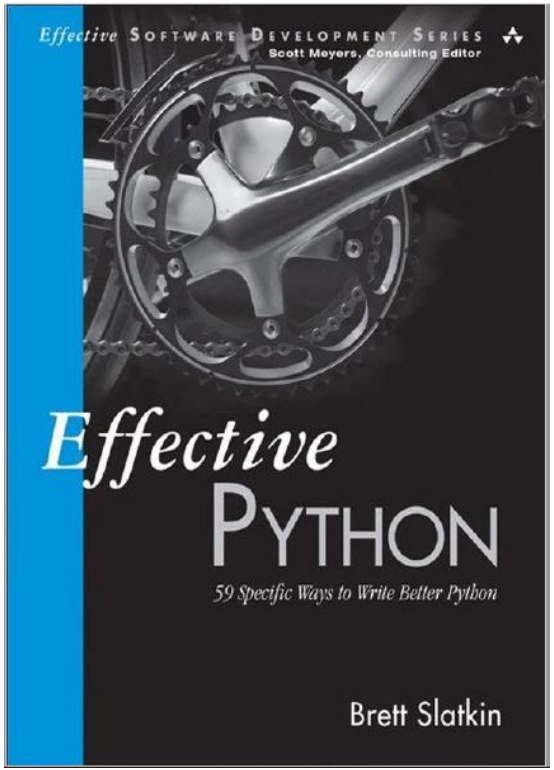
Effective Python, Brett Slatkin

- Pythonic Thinking [001 - 025]
- Functions [025 - 050]
- Classes and Inheritance [050 - 075]
- Metaclasses and Attributes [075 - 100]
- Concurrency and Parallelism [100 - 125]
- Built-in Modules [125 - 150]
- Collaboration [150 - 175]
- Production [175 - 200]



Effective Python, Brett Slatkin

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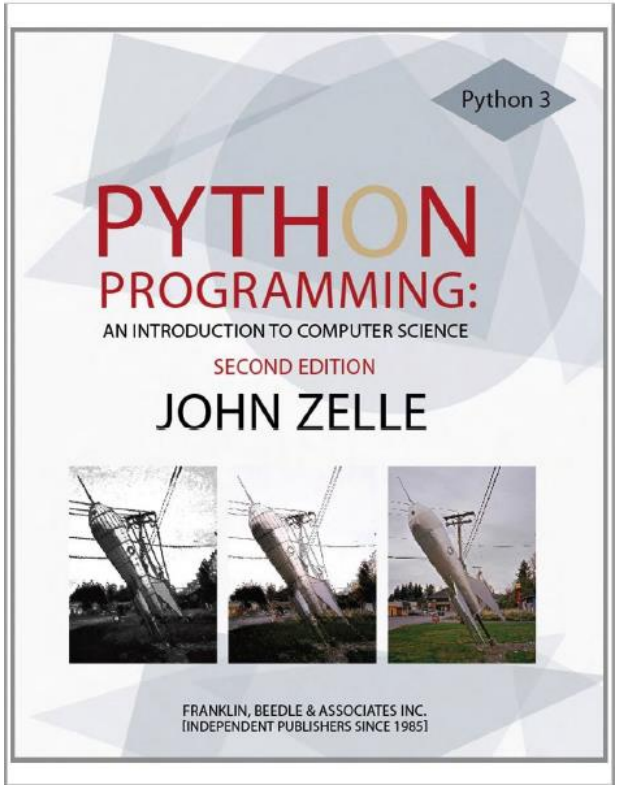
Python Programming, John Zelle

- Computers and Programs [001 - 020]
- Writing Simple Programs [020 - 045]
- Computing with Numbers [045 - 065]
- Objects and Graphics [065 - 100]
- Sequences: Strings, Lists, and Files [100 - 140]
- Defining Functions [140 - 165]
- Decision Structures [165 - 200]
- Loop Structures and Booleans [200 - 225]
- Simulation and Design [225 - 245]
- Defining Classes [245 - 280]
- Data Collections [280 - 325]
- Object-Oriented Design [325 - 360]
- Algorithm Design and Recursion [360 - 385]



Python Programming, John Zelle

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Python Coursera Specializations

- Introduction to Scripting in Python Specialization by Rice University [40 H]

https://www.coursera.org/specializations/introduction-scripting-in-python

- Python 3 Programming Specialization by University of Michigan [135 H]

https://www.coursera.org/specializations/python-3-programming

- Fundamentals of Computing Specialization by Rice University [115 H]

https://www.coursera.org/specializations/computer-fundamentals

- Learn to Program: Crafting Quality Code by University of Toronto [15 H]

https://www.coursera.org/learn/program-code

Python YouTube Playlists

- Python Tutorial Videos | Simplilearn [20 H] Channel: Simplilearn
  youtube.com/playlist?list=PLEiEAq2VkUUKoW1o-A-VEmkoGKSC26i_I
- Python Tutorial For Beginners | Edureka [45 H] Channel: edureka!
  youtube.com/playlist?list=PL9ooVrP1hQOHY-BeYrKHDrHKphsJOyRyu
- Python Tutorial for Beginners [40 H] Channel: ProgrammingKnowledge
  youtube.com/playlist?list=PLS1QulWo1RIaJECMeUT4LFwJ-ghgoSH6n
- Python 3 Programming Tutorial [10 H] Channel: codebasics
  youtube.com/playlist?list=PLeo1K3hjS3uslLfyvQlvUBokXkHPSve6S
- Learning to program with Python 3 [3 H] Channel: sentdex
  youtube.com/playlist?list=PLQVvvaa0QuDeAams7fkdcwOGBpGdHpXln
- Python 3 Tutorial for Beginners [30 H] Channel: ProgrammingKnowledge
  youtube.com/playlist?list=PLS1QulWo1RIYt4e0WnBp-ZjCNq8X0FX0J
- Complete Python Training Course [3 H] Channel: Python Programmer
  youtube.com/playlist?list=PLtb2Lf-cJ_AWhtJE6Rb5oWf02RC2gVU-J
- Python Tutorial for Beginners [20 H] Channel: Telusko
  youtube.com/playlist?list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3
- Complete Python tutorial in Hindi (2020) [20 H] Channel: Harshit vashisth
  youtube.com/playlist?list=PLwgFb6VsUj_IQTpQKDtLXKXElQychT_2j

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Section 6: Python Installation

Python Interpreters Installation

python.org

anaconda.com/distribution

jetbrains.com/pycharm

spyder-ide.org

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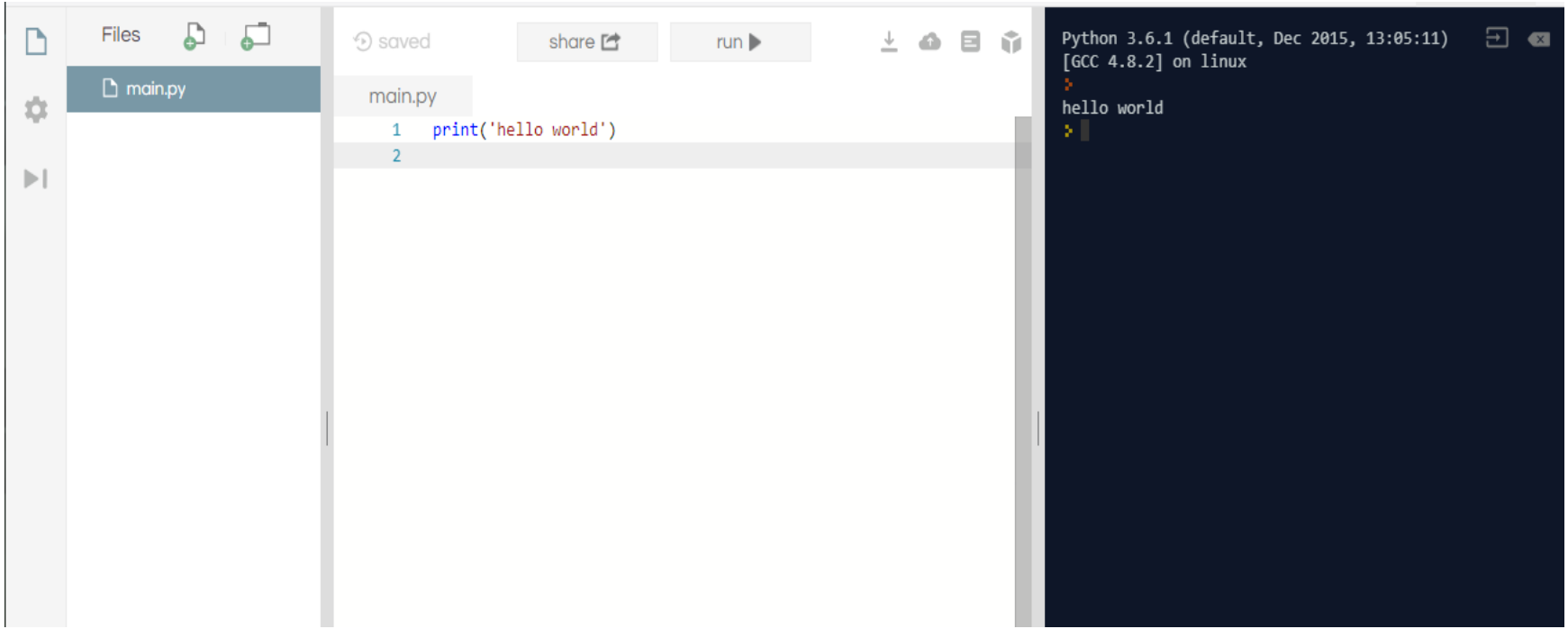
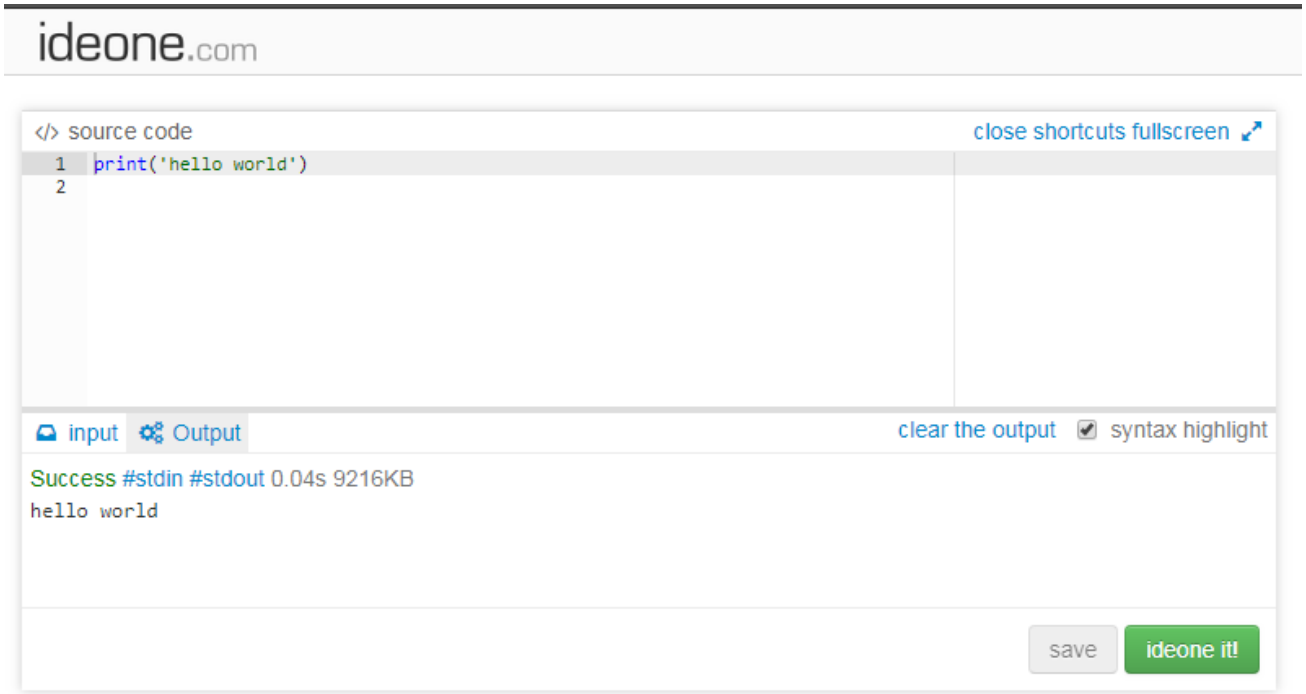
Python Online Interpreters

repl.it online interpreter: repl.it/languages/python3



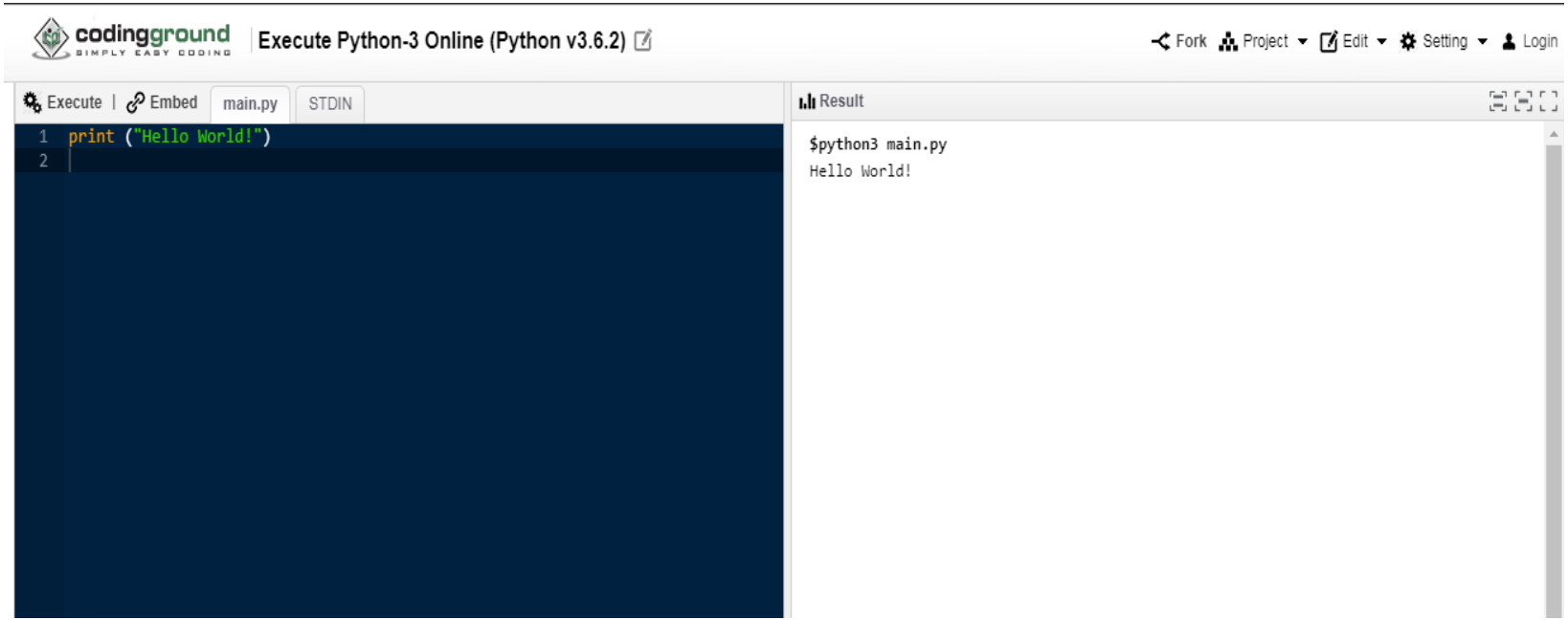
Python Online Interpreters

ideone online interpreter: ideone.com



Python Online Interpreters

Tutorials point online interpreter: tutorialspoint.com/execute_python3_online.php



Python IDE Installation

1. Go to Download Python page on the official site and click **Download Python 3.6.0** (You may see different version name).

2. When the download is completed, double-click the file and follow the instructions to install it.
   When Python is installed, a program called IDLE is also installed along with it. It provides graphical user interface to work with Python.

3. Open IDLE, copy the following code below and press enter.

```
print("Hello, World!")
```

4. To create a file in IDLE, go to **File** > **New Window** (Shortcut: **Ctrl+N**).

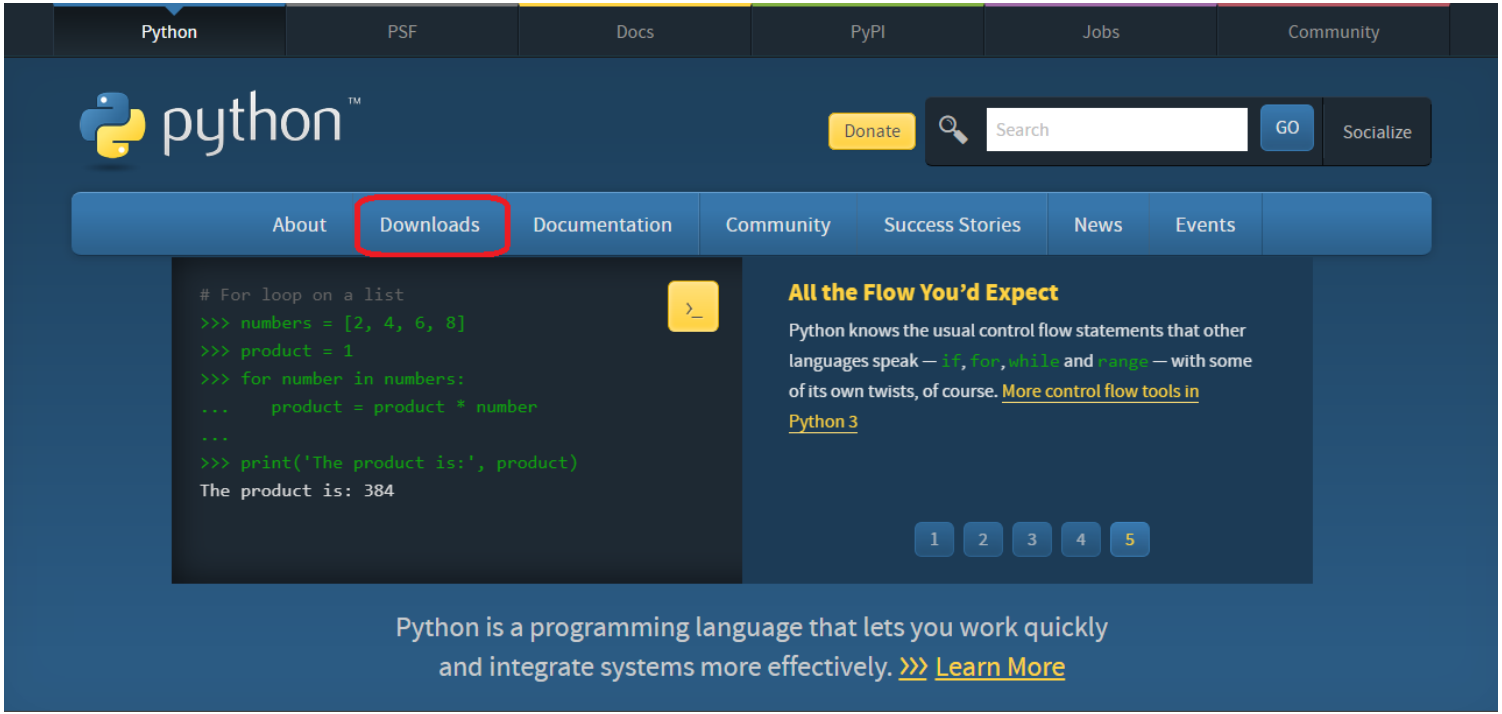
5. Write Python code (you can copy the code below for now) and save (Shortcut: **Ctrl+S**) with **.py** file extension like: hello.py or your-first-program.py

```
1  print("Hello, World!")
```

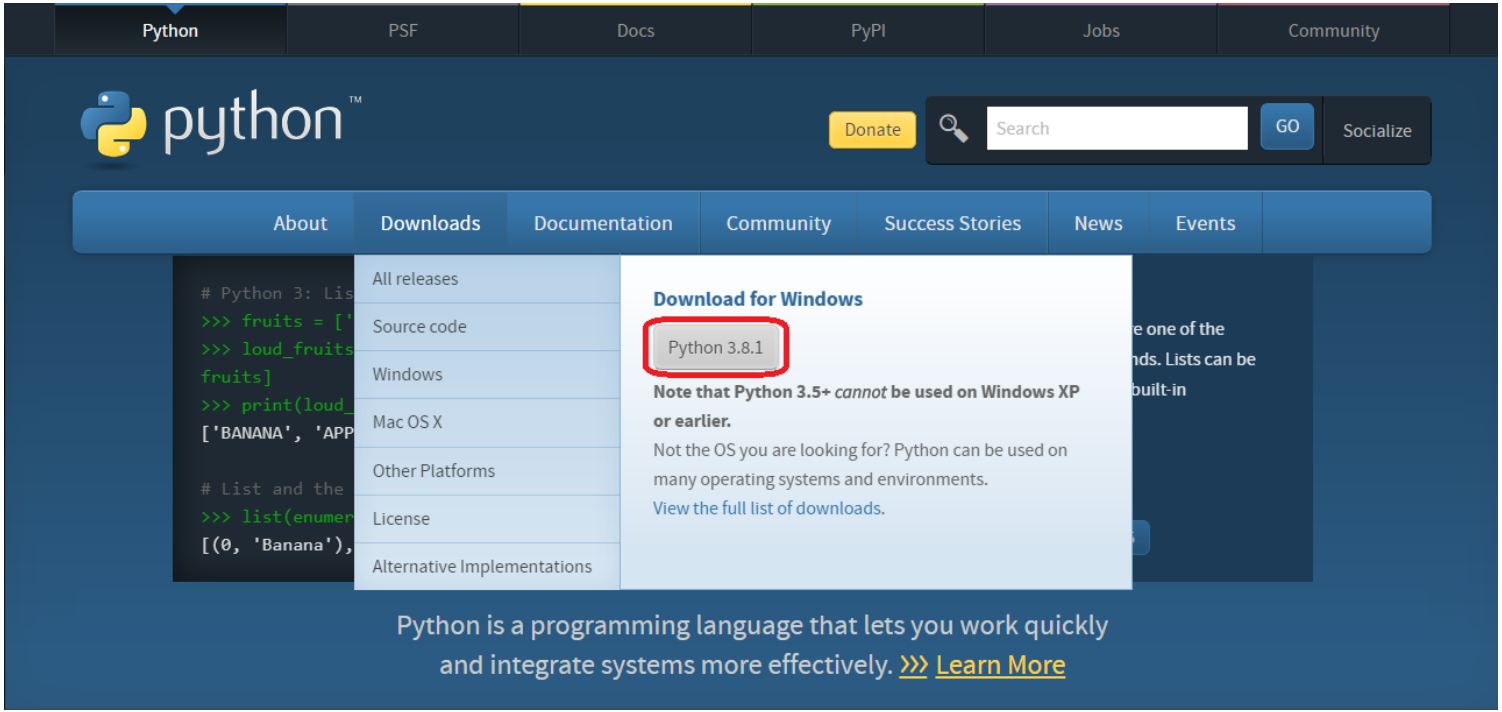
6. Go to **Run** > **Run module** (Shortcut: **F5**) and you can see the output.
   Congratulations, you've successfully run your first Python program.

python.org

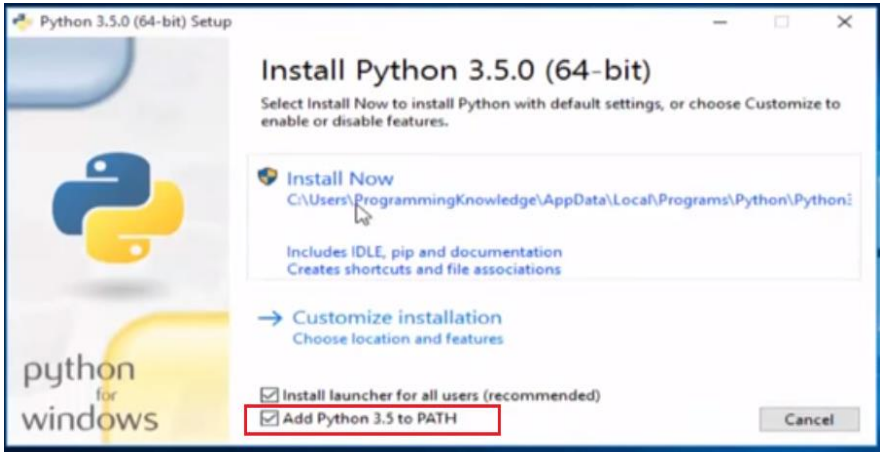
Python IDE Installation

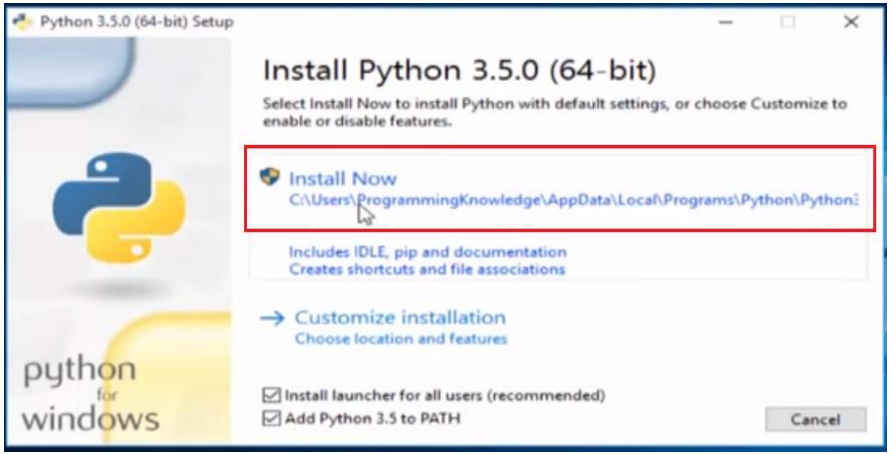


Python IDE Installation

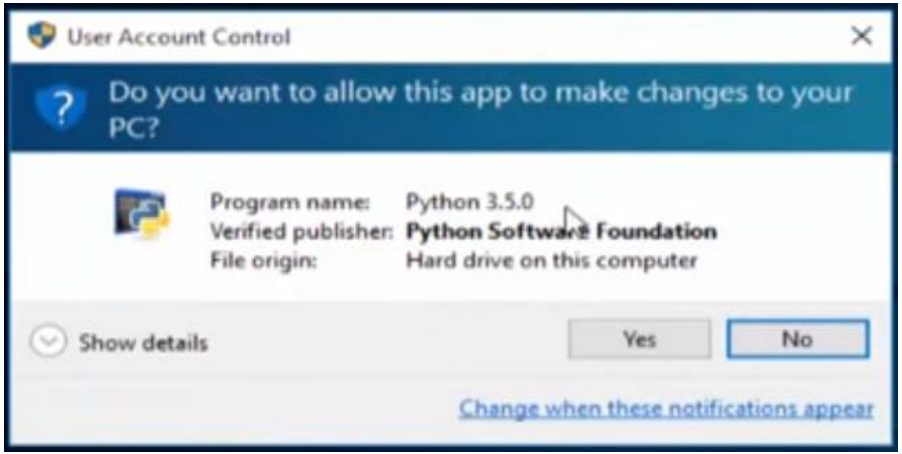


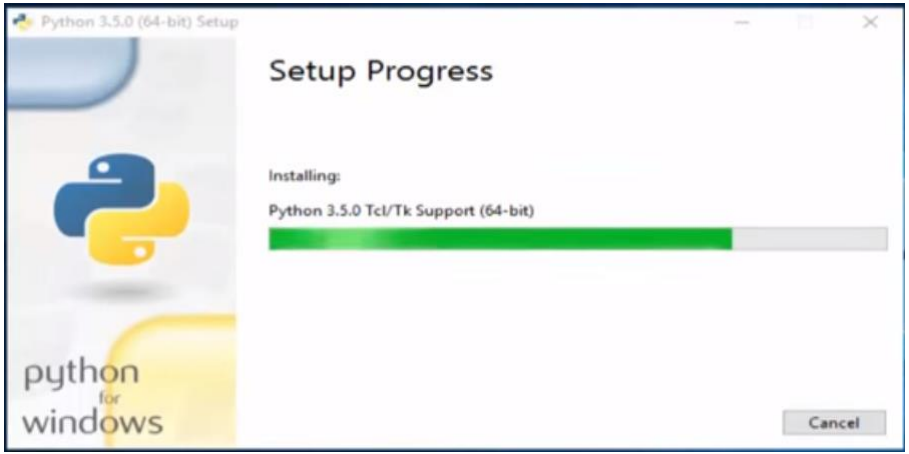
Python IDE Installation





Python IDE Installation





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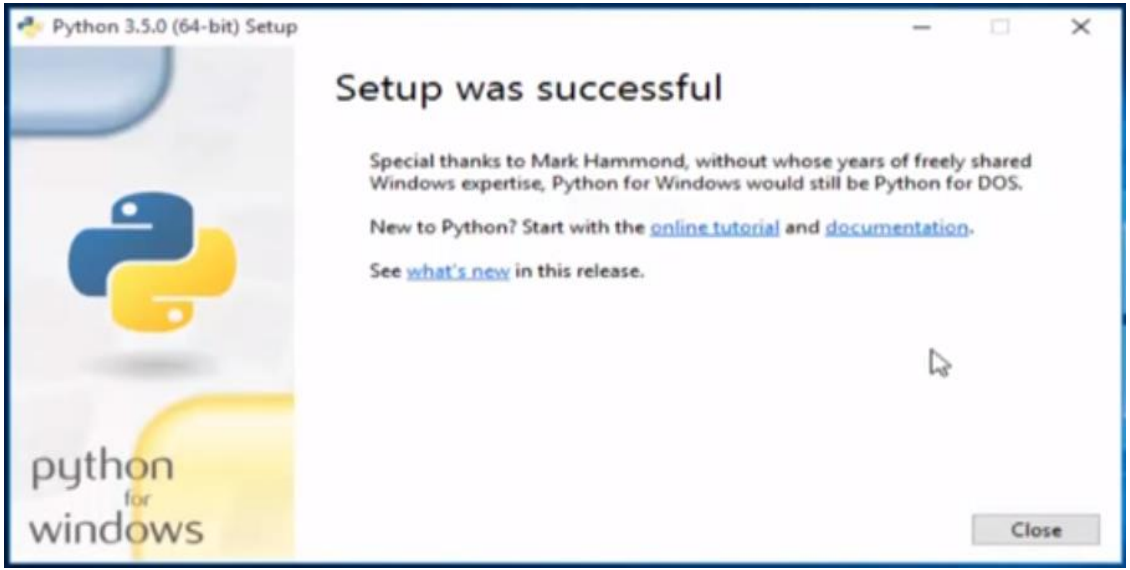

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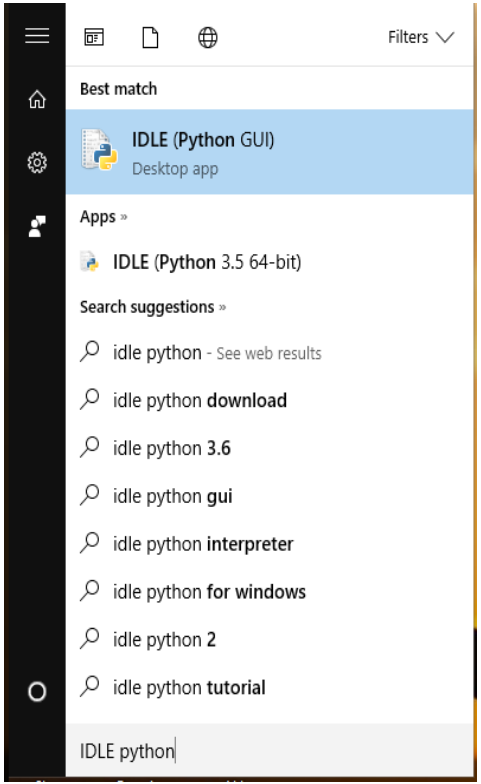

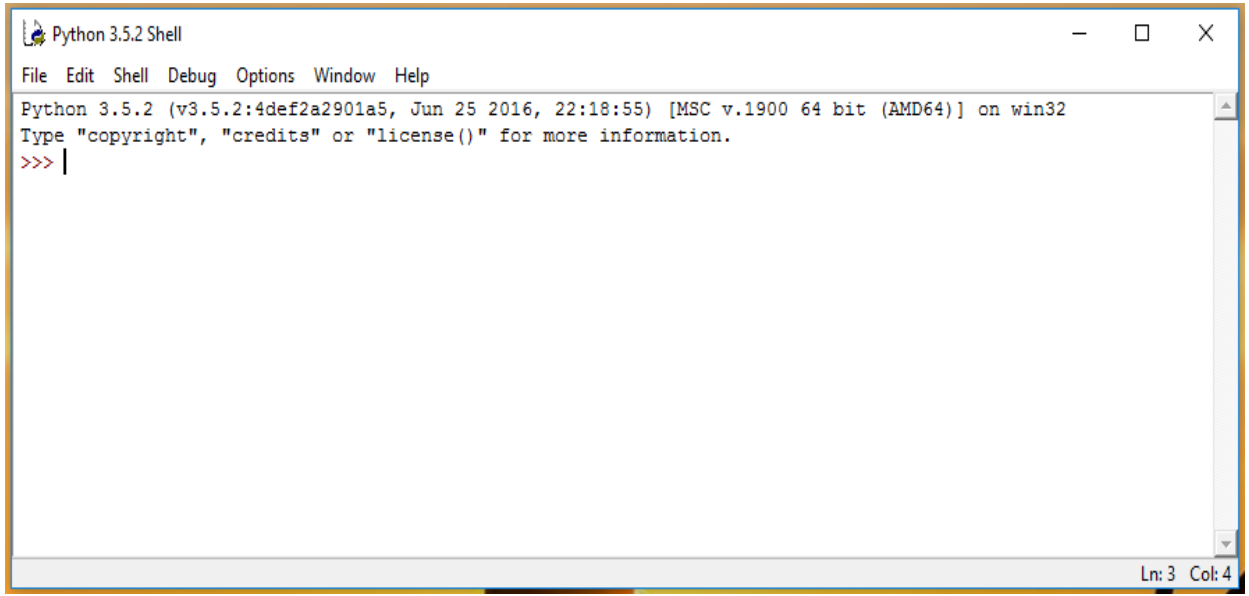

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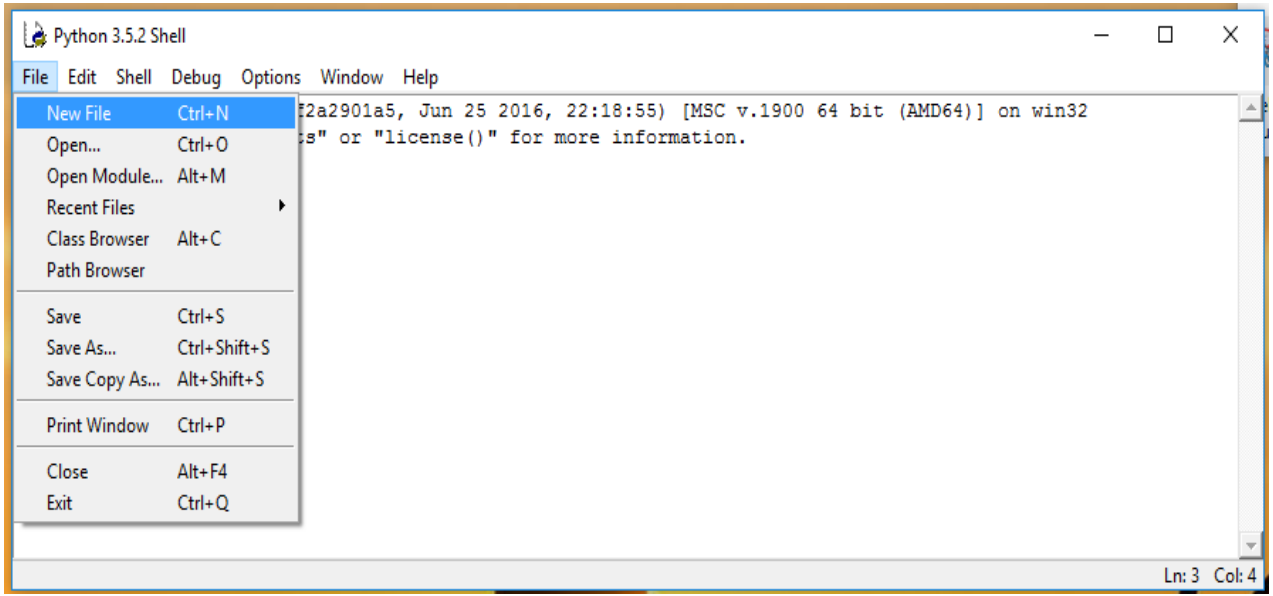
Python IDE Installation



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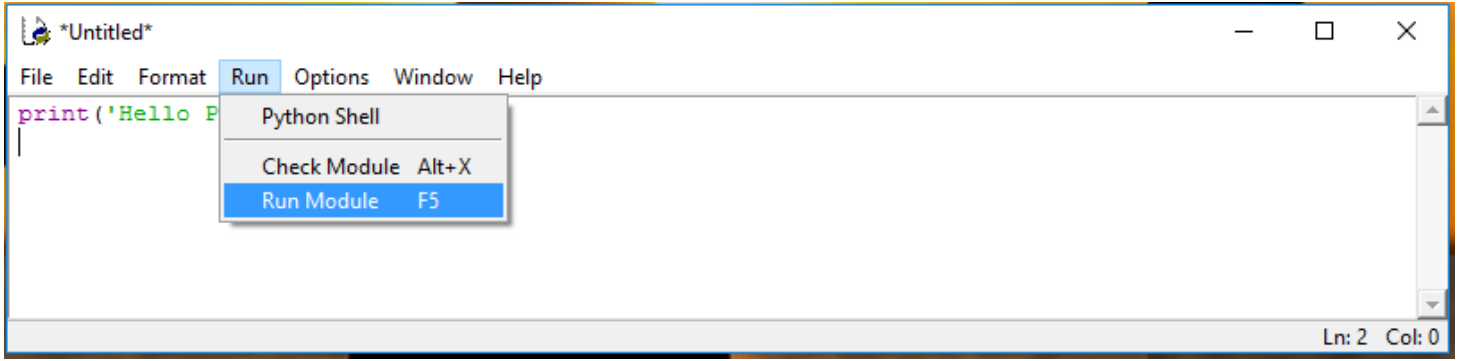
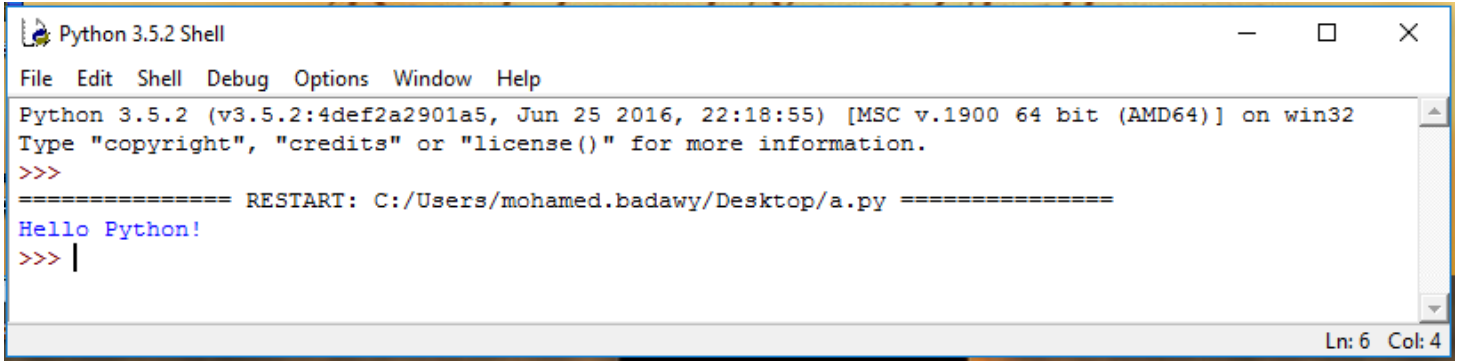


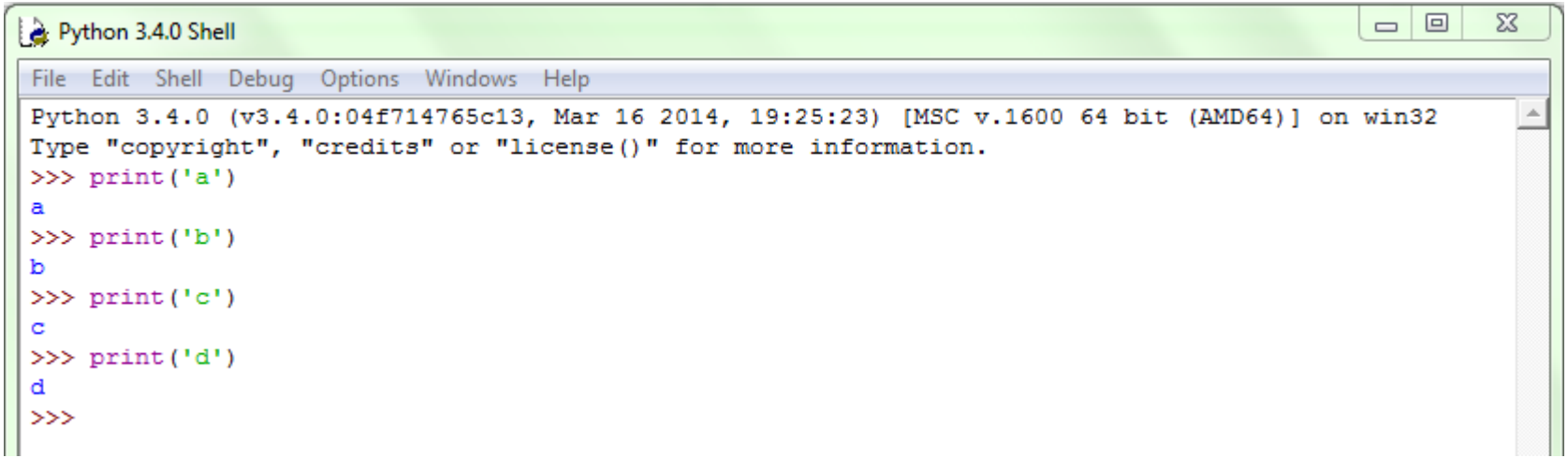


First Python Program

There are two mods of programming to execute the programs

1. Interactive Mode Programming

Invoking the interpreter without passing a script file as a parameter brings up the following prompt



First Python Program

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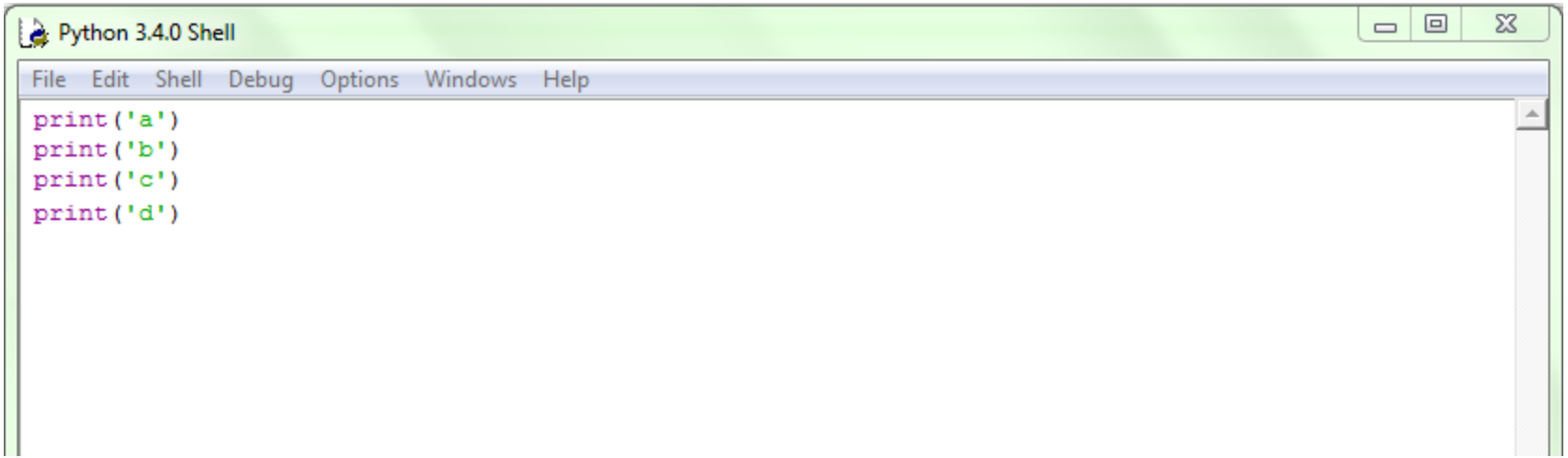
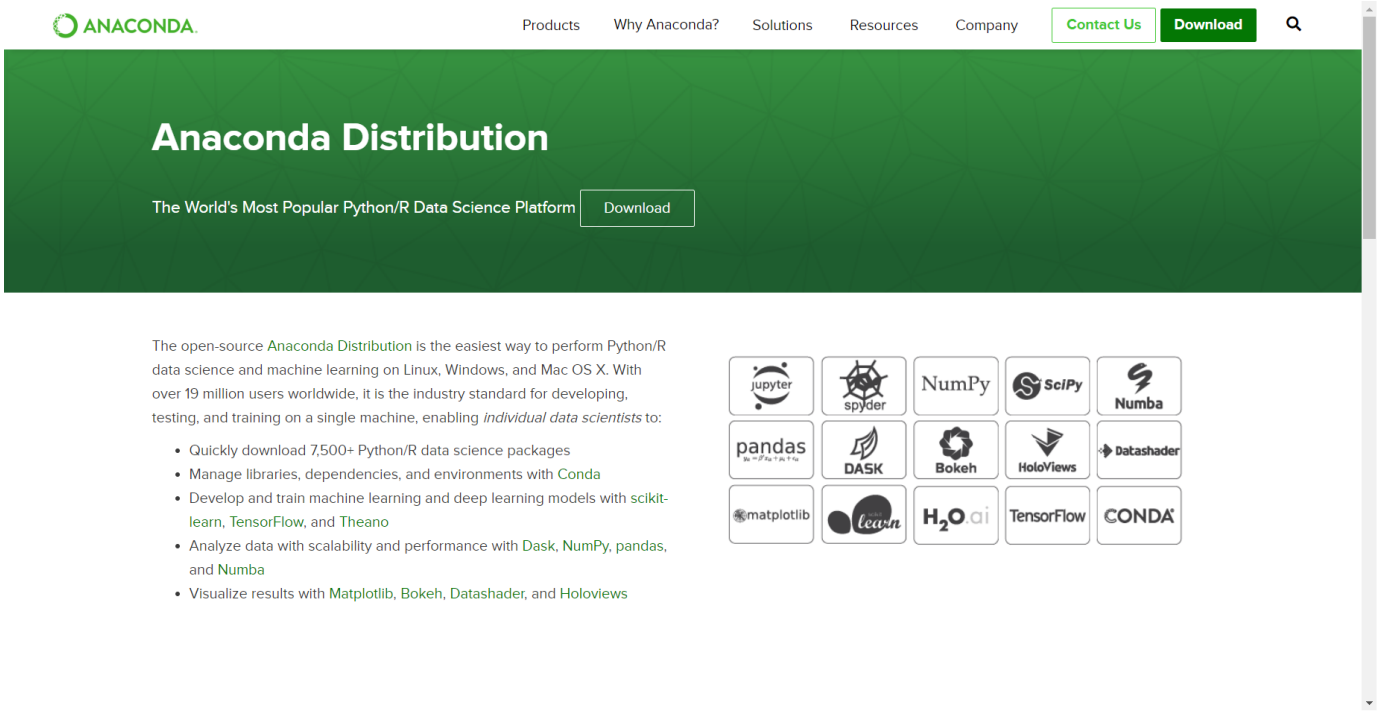


Python Anaconda Installation



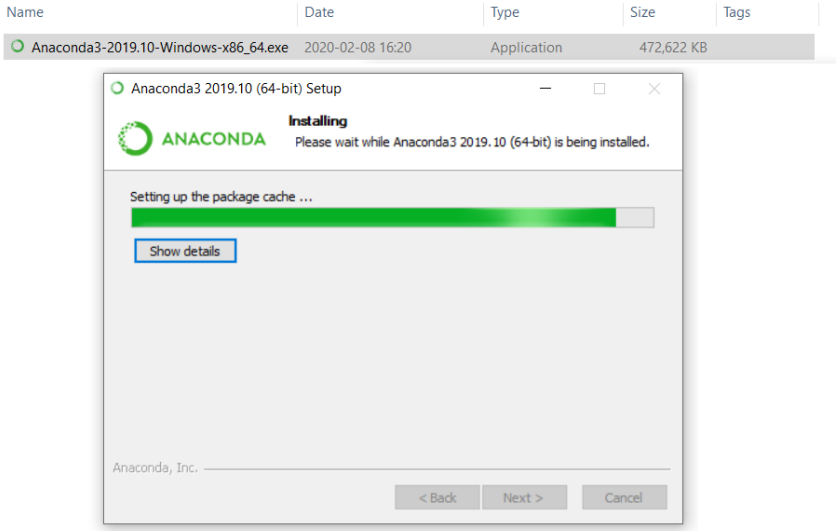
ANACONDA®

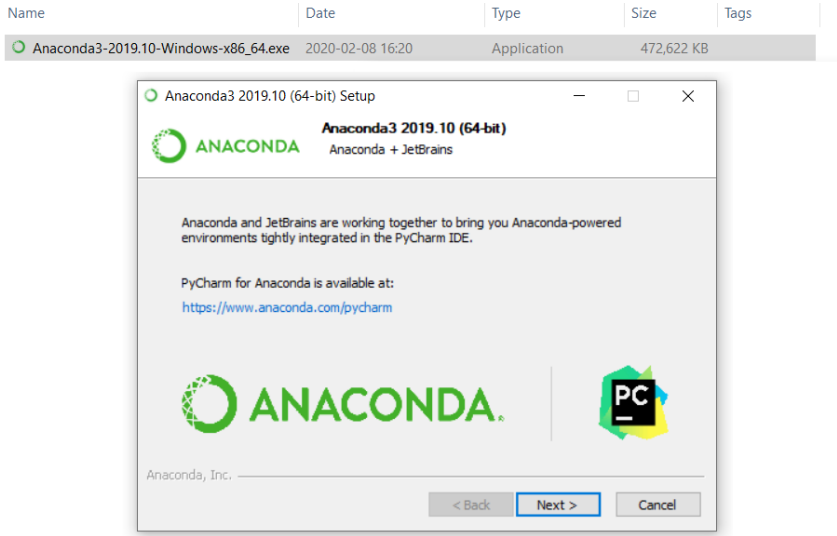
anaconda.com/distribution

Python Anaconda Installation

anaconda.com/distribution

Python Anaconda Installation





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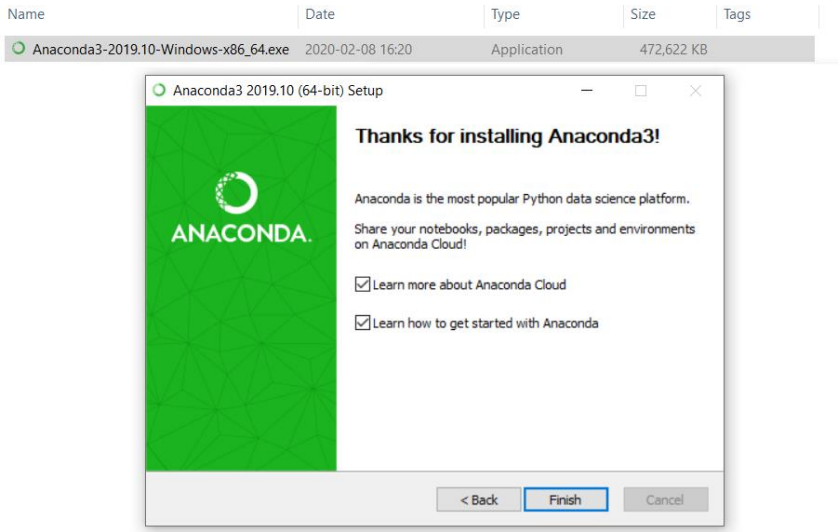
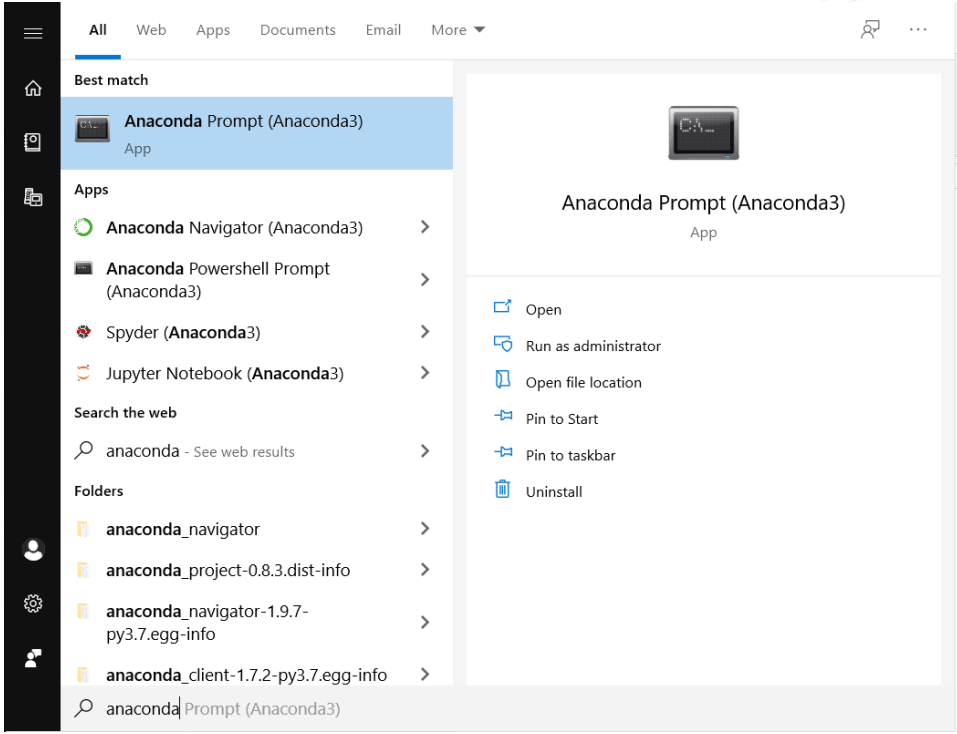
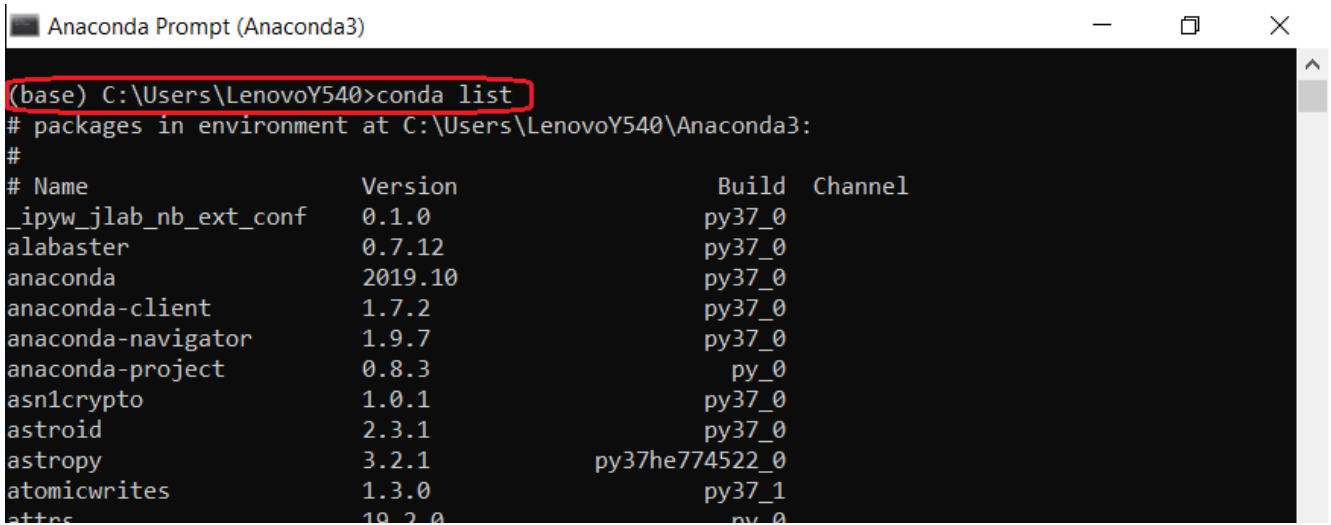




Python Anaconda Installation

Ensure that all steps done successfully, you should run the following command lines:



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First Python Program

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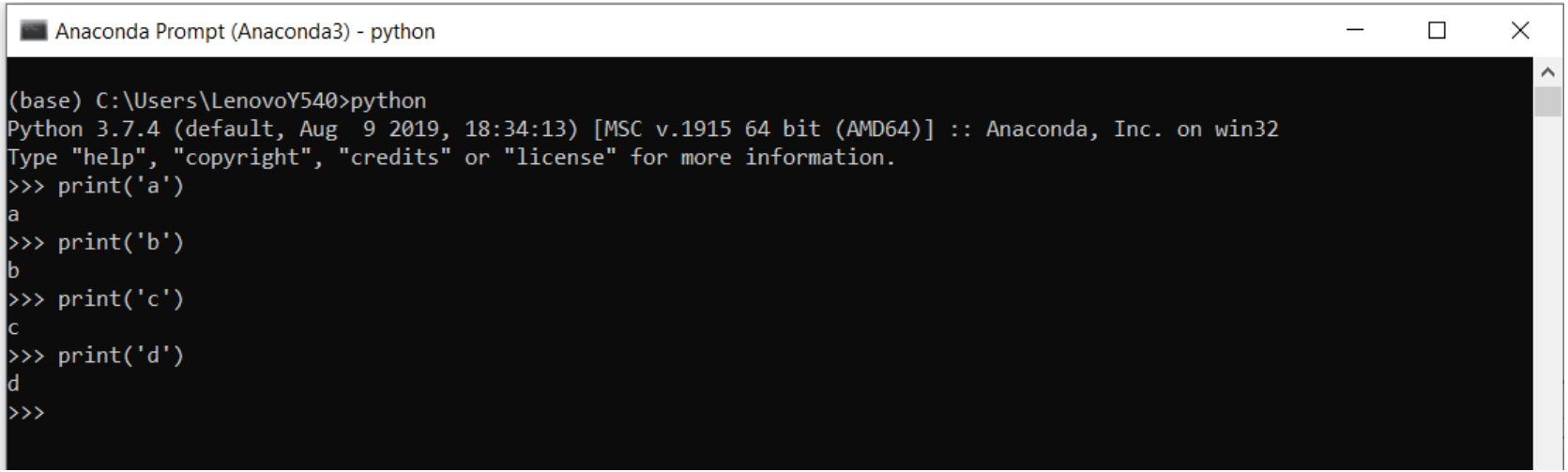

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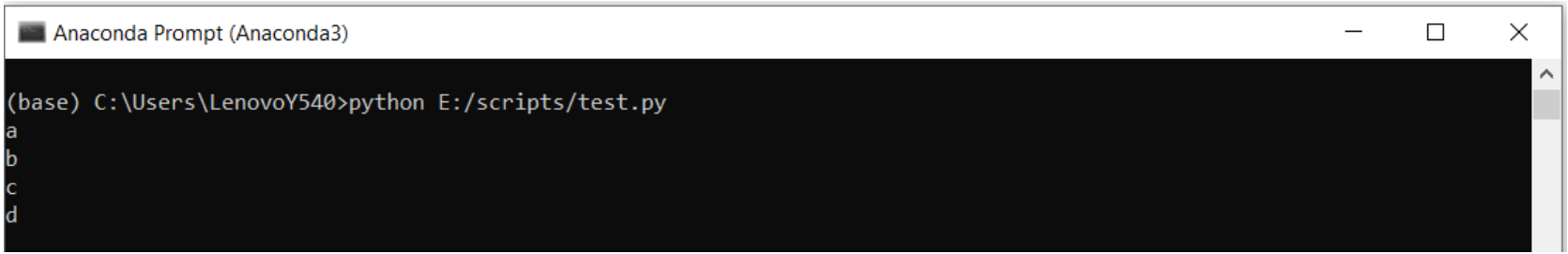

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Lecture Agenda

- ✓ Section 1: Python Features
- ✓ Section 2: Python Content
- ✓ Section 3: Practice on Online Judges
- ✓ Section 4: Tutorials and References
- ✓ Section 5: Online Courses
- ✓ Section 6: Python Installation

DO
MORE.