

CSIT110

Fundamental Programming with Python

Getting started

Goh X. Y.



Common uses of programming

Software designs

Hardware designs

Communications

...

Common uses of Python

Data visualization

Computer vision research and applications

Machine learning research and applications

...

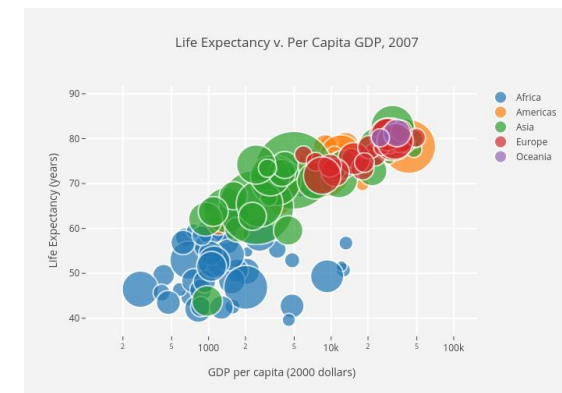
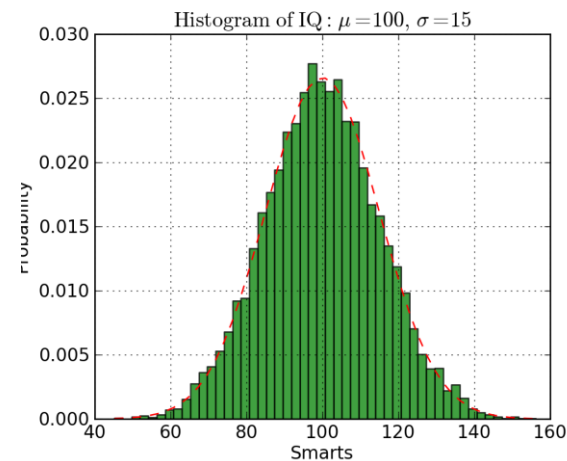
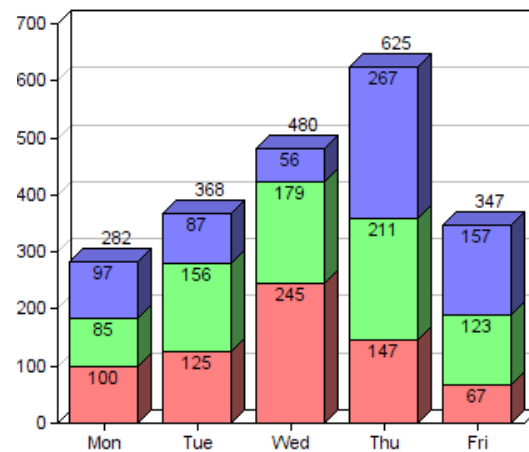
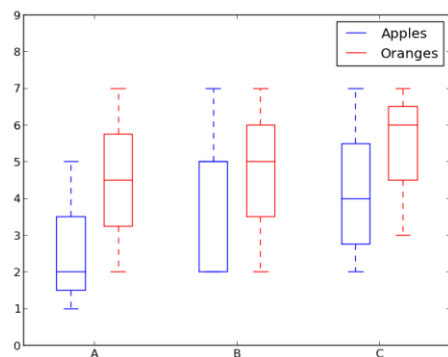
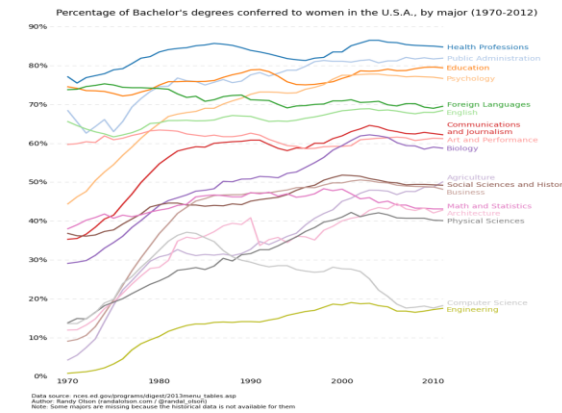
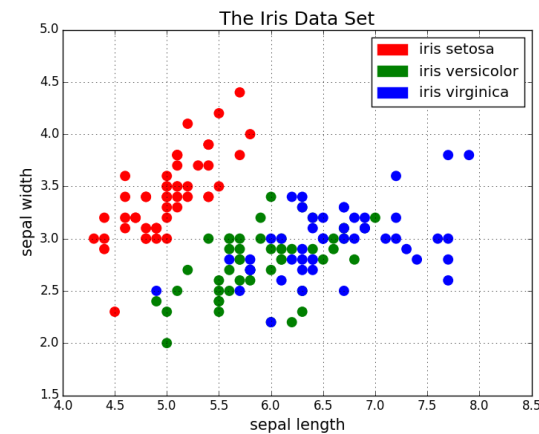
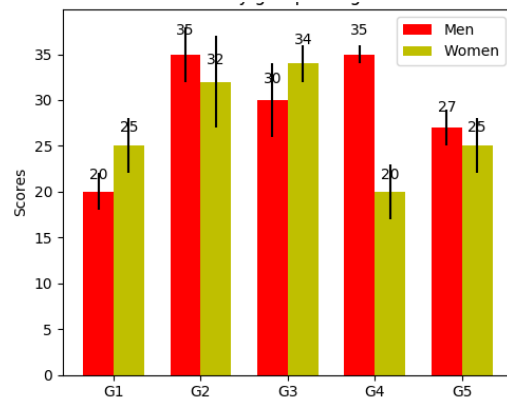
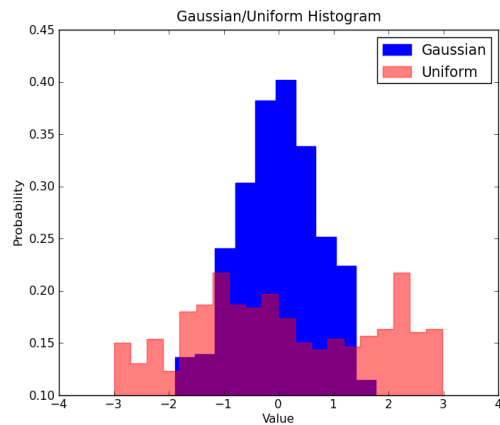


Image source: <https://towardsdatascience.com/5-quick-and-easy-data-visualizations-in-python-with-code-a2284bae952f>



Images from:
<https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/>
<https://www.learnopencv.com/pytorch-for-beginners-semantic-segmentation-using-torchvision/>

Learning Objectives

- Introduction
 - Online resources
 - Installation
 - Sequential Programming
- Data types and structures
- Control flow and iteration
- Functions
- Class
- Best practices

Course Information

- Python 3.x.x
- Tutorials
- Assignments Examination



PYPL Popularity of Programming Language

Worldwide, Sept 2020 compared to a year ago:

Rank	Change	Language	Share	Trend
1		Python	31.56 %	+2.9 %
2		Java	16.4 %	-3.1 %
3		Javascript	8.38 %	+0.3 %
4		C#	6.5 %	-0.8 %
5		PHP	5.85 %	-0.5 %
6		C/C++	5.8 %	+0.0 %
7		R	4.08 %	+0.3 %
8		Objective-C	2.79 %	+0.2 %
9		Swift	2.35 %	-0.1 %
10		TypeScript	1.92 %	+0.1 %
11		Matlab	1.65 %	-0.1 %
12		Kotlin	1.61 %	+0.1 %
13	↑↑	Go	1.44 %	+0.3 %
14	↓	Ruby	1.22 %	-0.2 %

The PYPL Popularity of Programming Language Index is created by analyzing how often language tutorials are searched on Google.

The more a language tutorial is searched, the more popular the language is assumed to be. It is a leading indicator. The raw data comes from Google Trends.

If you believe in collective wisdom, the PYPL Popularity of Programming Language index can help you decide which language to study, or which one to use in a new software project.

- ✓ extensive support modules
- ✓ easy integration with web services
- ✓ user-friendly data structures
- ✓ free




What do I need?

- Code editor
- Python interpreter

Python software foundation website: <http://www.python.org>

https://www.python.org

Python PSF Docs PyPI Jobs

 python™

Search GO

About Downloads Documentation Community Success Stories News Events

```
# Python 3: Fibonacci series up to n
>>> def fib(n):
>>>     a, b = 0, 1
>>>     while a < n:
>>>         print(a, end=' ')
>>>         a, b = b, a+b
>>>     print()
>>> fib(1000)
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987
```

Functions Defined

The core of extensible programming is defining functions. Python allows mandatory and optional arguments, keyword arguments, and even arbitrary argument lists. [More about defining functions in Python 3](#)

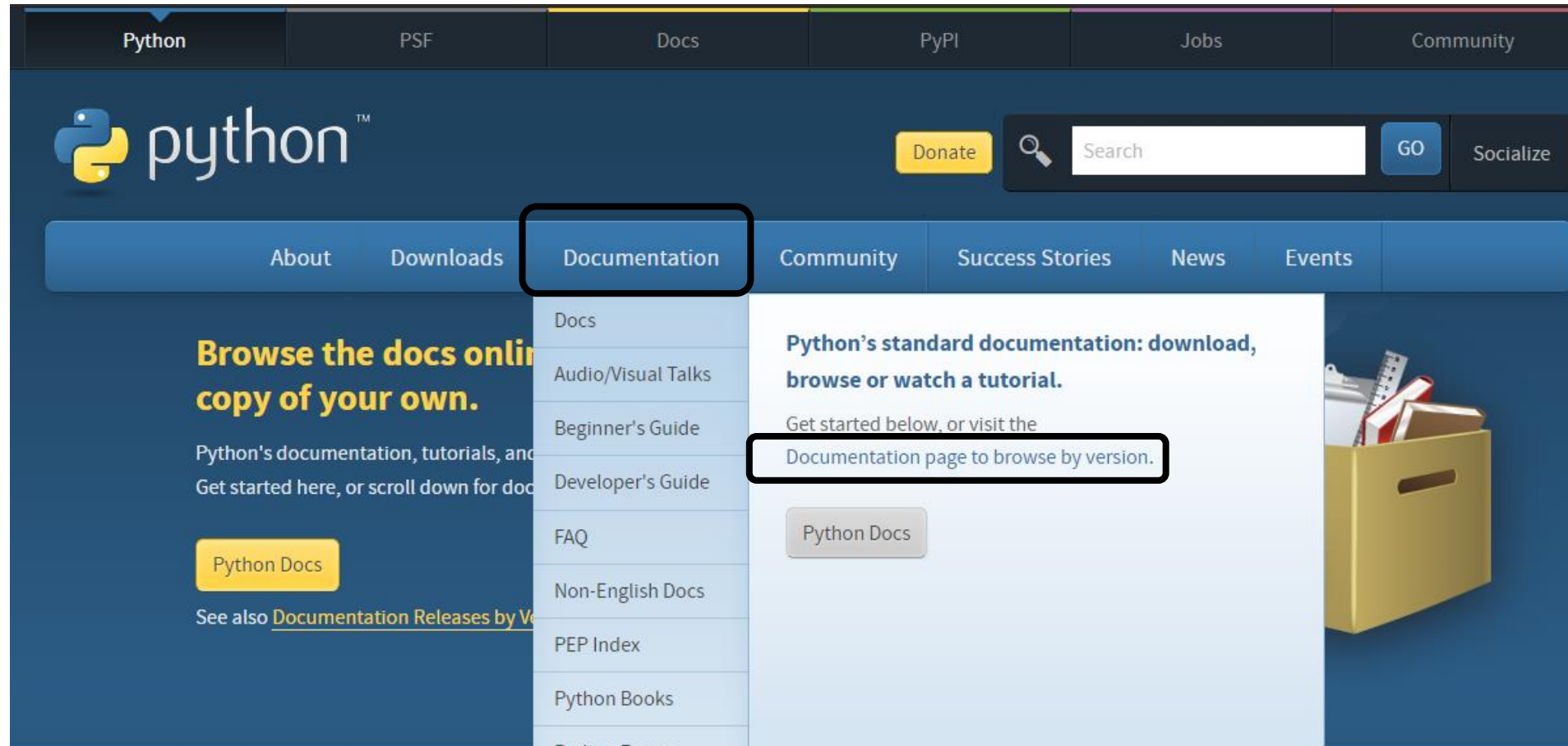
1 2 3 4 5

Python software foundation website: <http://www.python.org>

Useful resources available on this website:

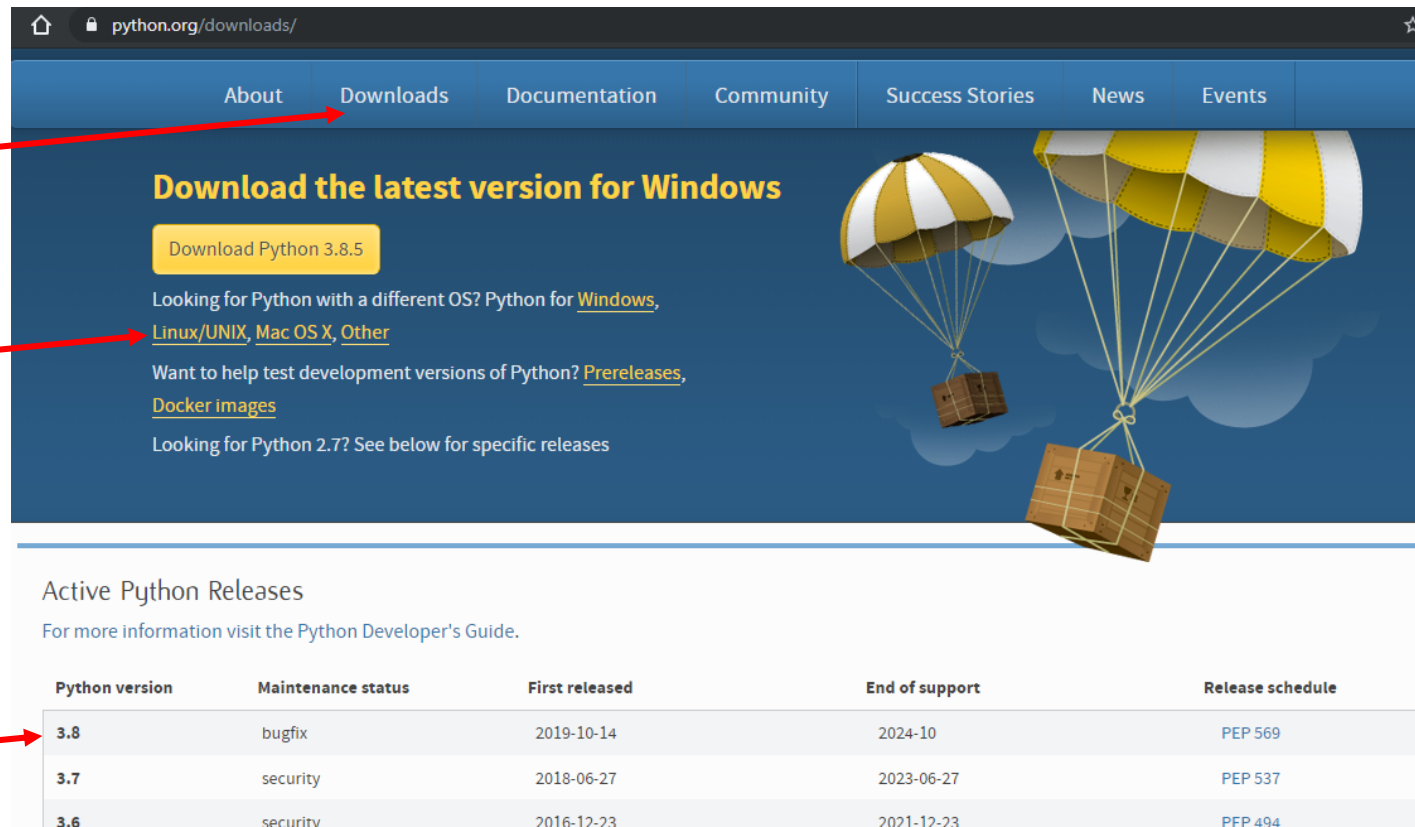
- Getting started
- Tutorials
- Documentation
- Installation guide
- ...

Documentation



Downloads

We are going to use Python Version 3 in this course.



The screenshot shows the Python.org Downloads page. The navigation bar includes links for About, Downloads, Documentation, Community, Success Stories, News, and Events. The main content area features a large blue banner with the text "Download the latest version for Windows" and a yellow button labeled "Download Python 3.8.5". Below this, there are links for "Linux/UNIX, Mac OS X, Other", "Prereleases", and "Docker images". A table titled "Active Python Releases" lists the current versions of Python, their maintenance status, release dates, end of support dates, and release schedules. Red arrows point to the "Downloads" link in the navigation bar, the "Download Python 3.8.5" button, and the "3.8" row in the table.

Python version	Maintenance status	First released	End of support	Release schedule
3.8	bugfix	2019-10-14	2024-10	PEP 569
3.7	security	2018-06-27	2023-06-27	PEP 537
3.6	security	2016-12-23	2021-12-23	PEP 494

Python installation for Windows

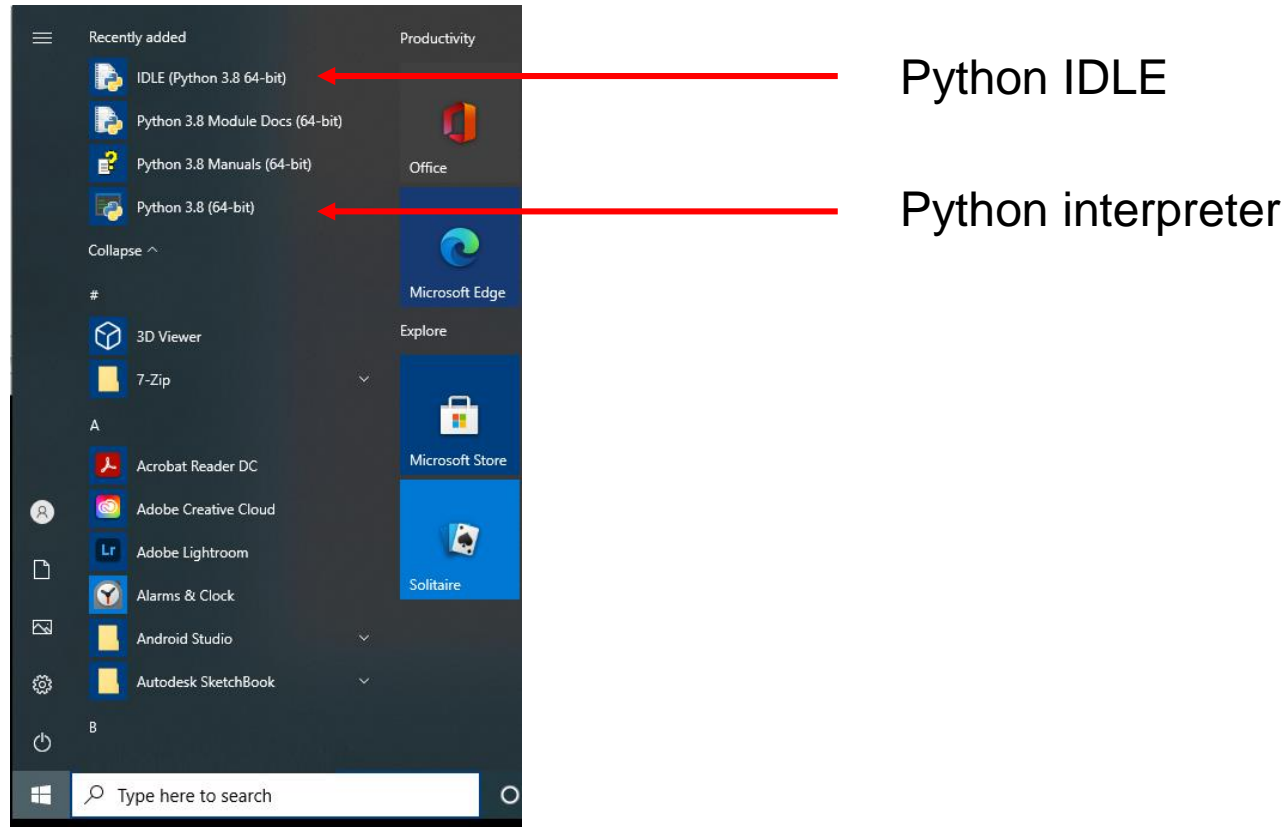
Installation - Windows

First, download and run the **Windows x86 executable** installer from Python webpage



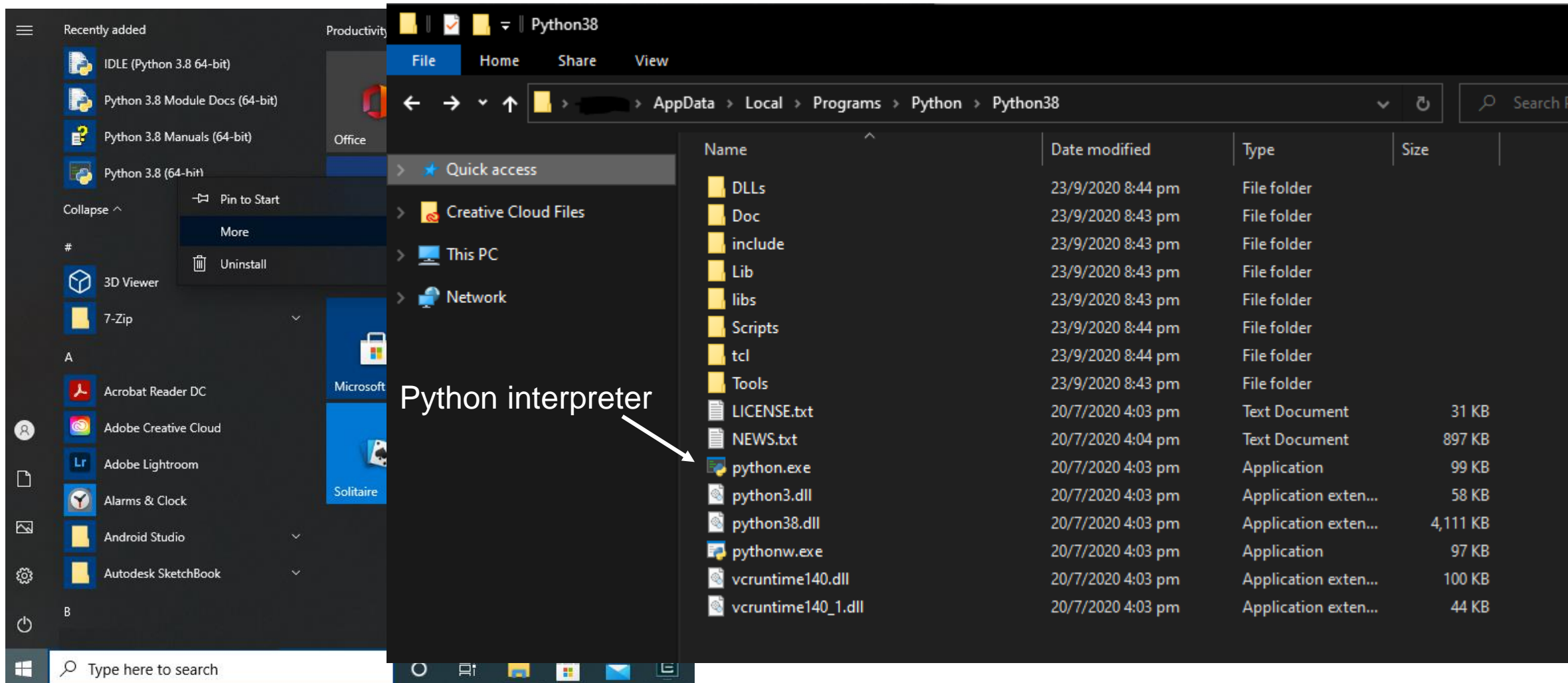
Installation - Windows

On Start Menu, I can see there are two icons for Python Interpreter and Python IDLE



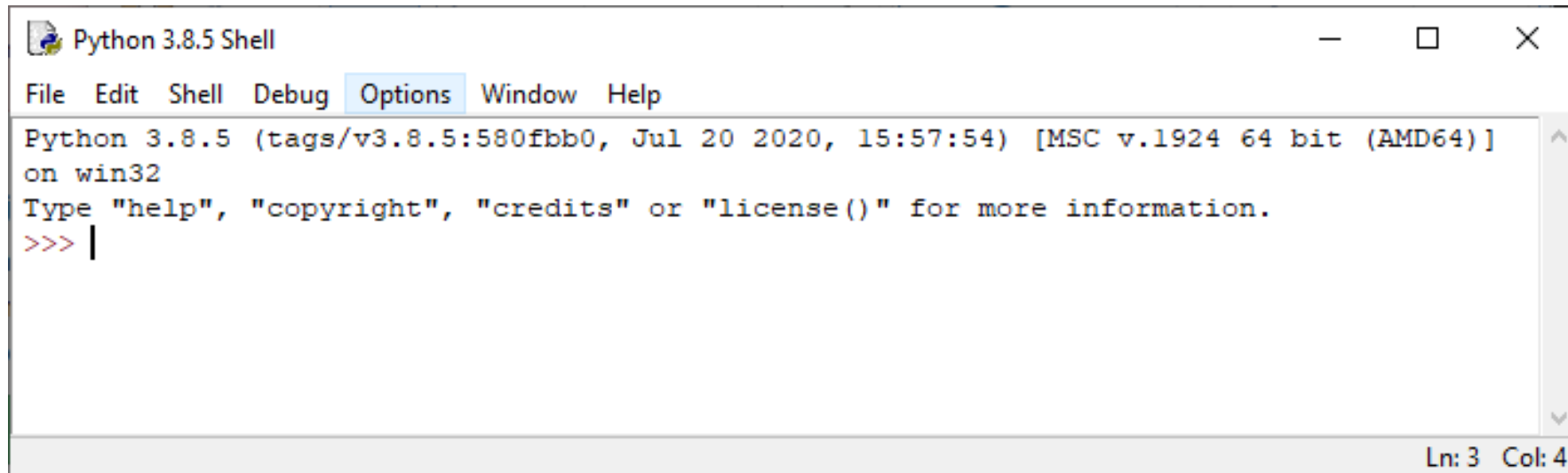
Installation - Windows

After installation you can see the python application



Installation - Windows

Click on the Python IDLE icon on the start menu,
a new window will appear

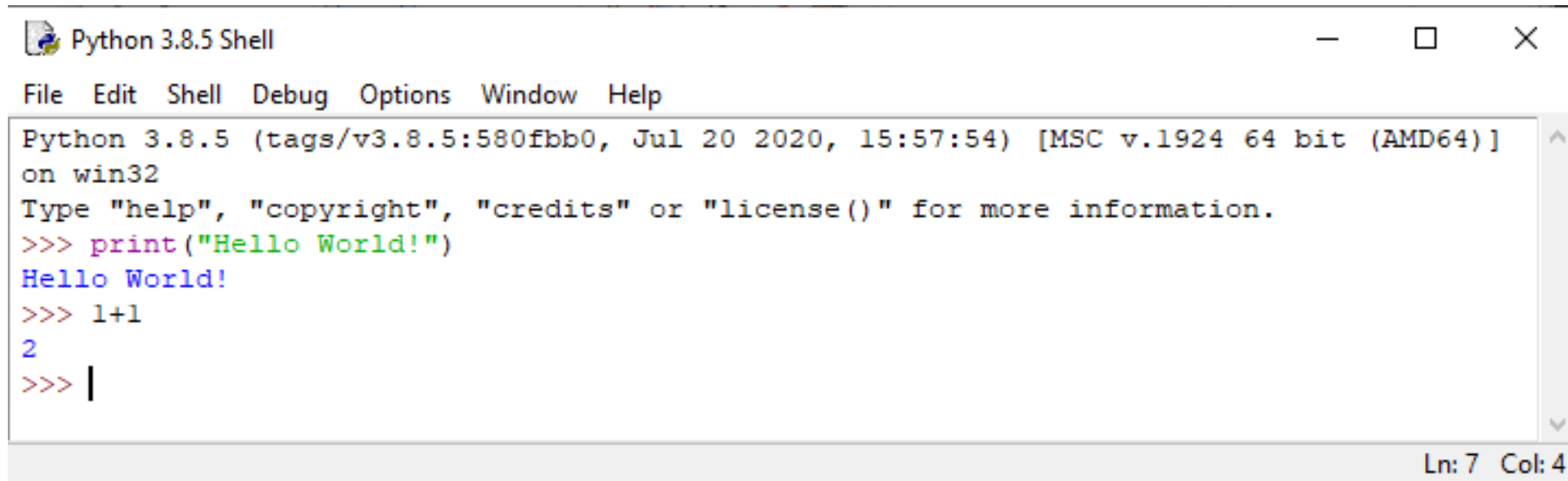


Installation - Windows

Type the following Python code into the IDLE

```
>>>print("Hello world!")
```

```
>>>1+1
```



The screenshot shows a window titled "Python 3.8.5 Shell" with a menu bar (File, Edit, Shell, Debug, Options, Window, Help). The text area contains the following output and input:

```
Python 3.8.5 (tags/v3.8.5:580fbb0, Jul 20 2020, 15:57:54) [MSC v.1924 64 bit (AMD64)]
on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> print("Hello World!")
Hello World!
>>> 1+1
2
>>> |
```

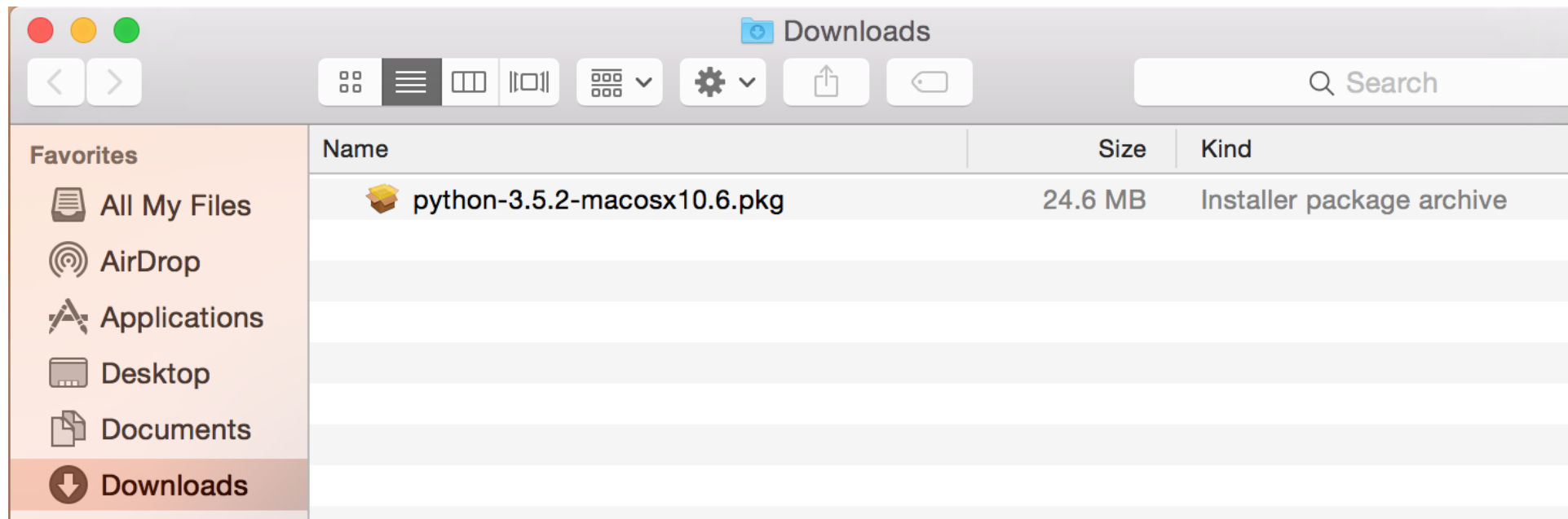
The status bar at the bottom right indicates "Ln: 7 Col: 4".

Python installation for Mac

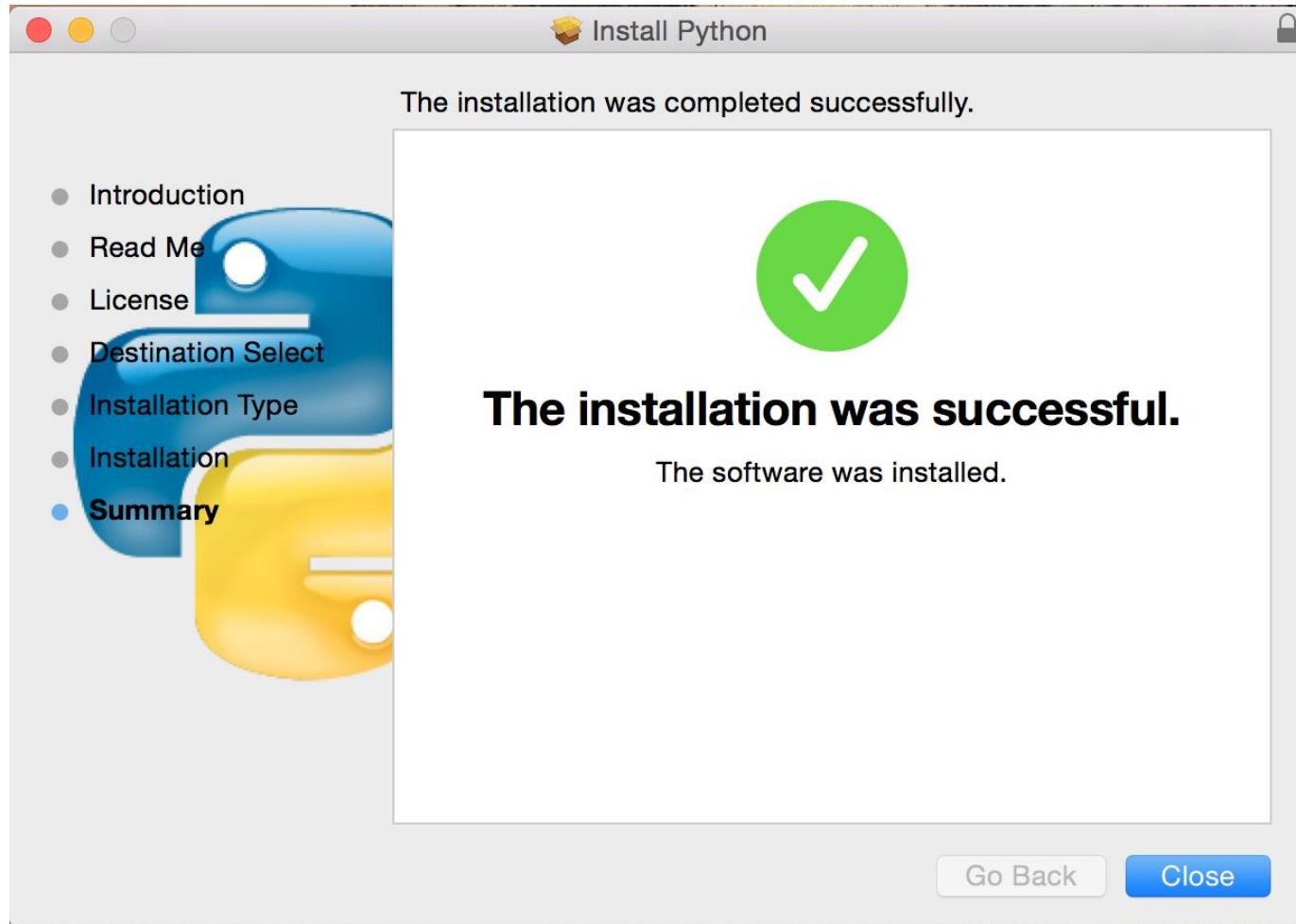
Installation - Mac

Run the download Python package

And follow the instructions in the installation wizard

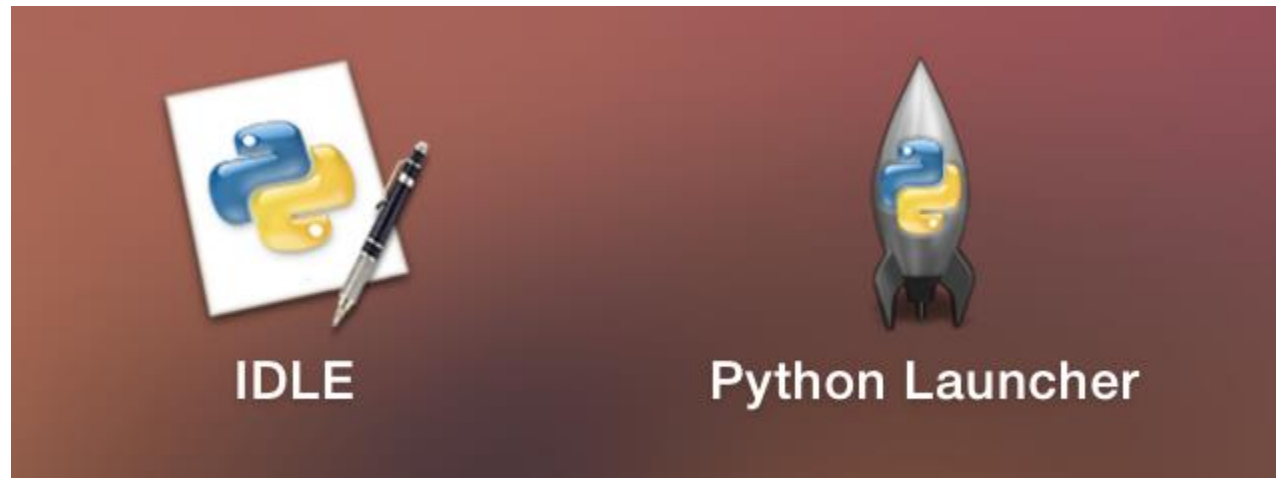


Installation - Mac



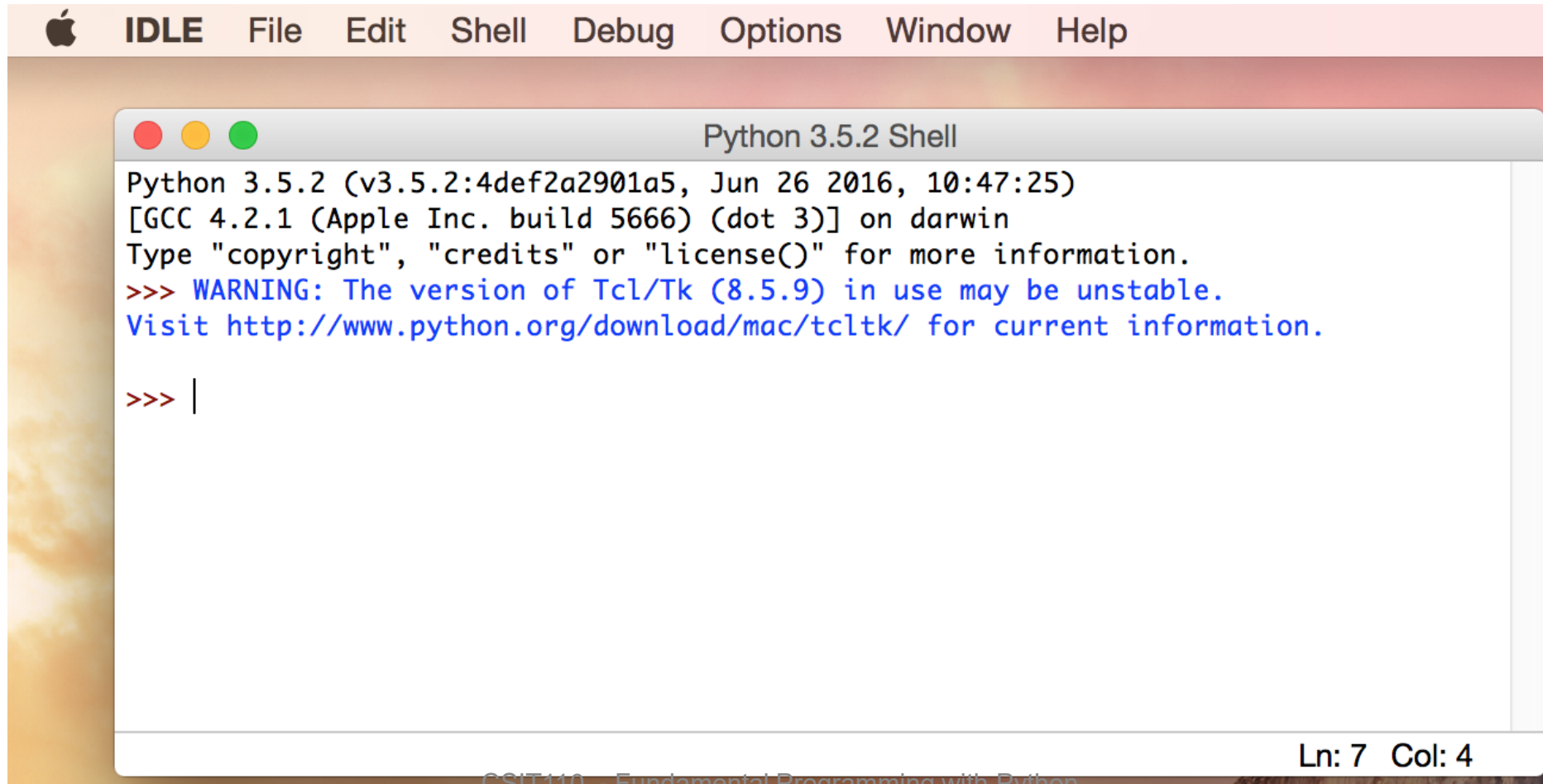
Installation - Mac

On the launch pad



Installation - Mac

Run the IDLE



```
Python 3.5.2 (v3.5.2:4def2a2901a5, Jun 26 2016, 10:47:25)
[GCC 4.2.1 (Apple Inc. build 5666) (dot 3)] on darwin
Type "copyright", "credits" or "license()" for more information.
>>> WARNING: The version of Tcl/Tk (8.5.9) in use may be unstable.
Visit http://www.python.org/download/mac/tcltk/ for current information.

>>> |
```

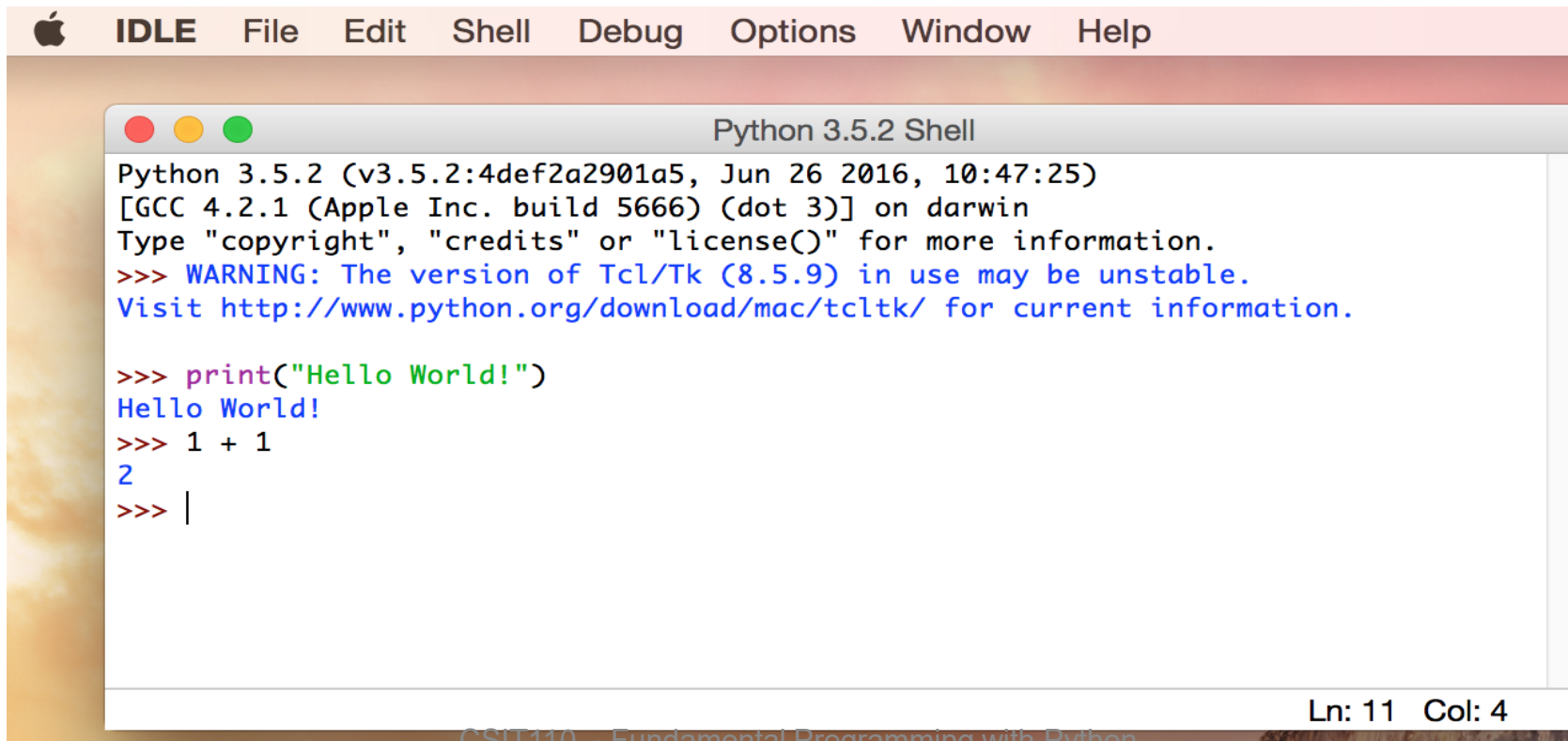
Ln: 7 Col: 4

Installation - Mac

Type the following Python code into the IDLE

```
>>>print("Hello world!")
```

```
>>>1+1
```



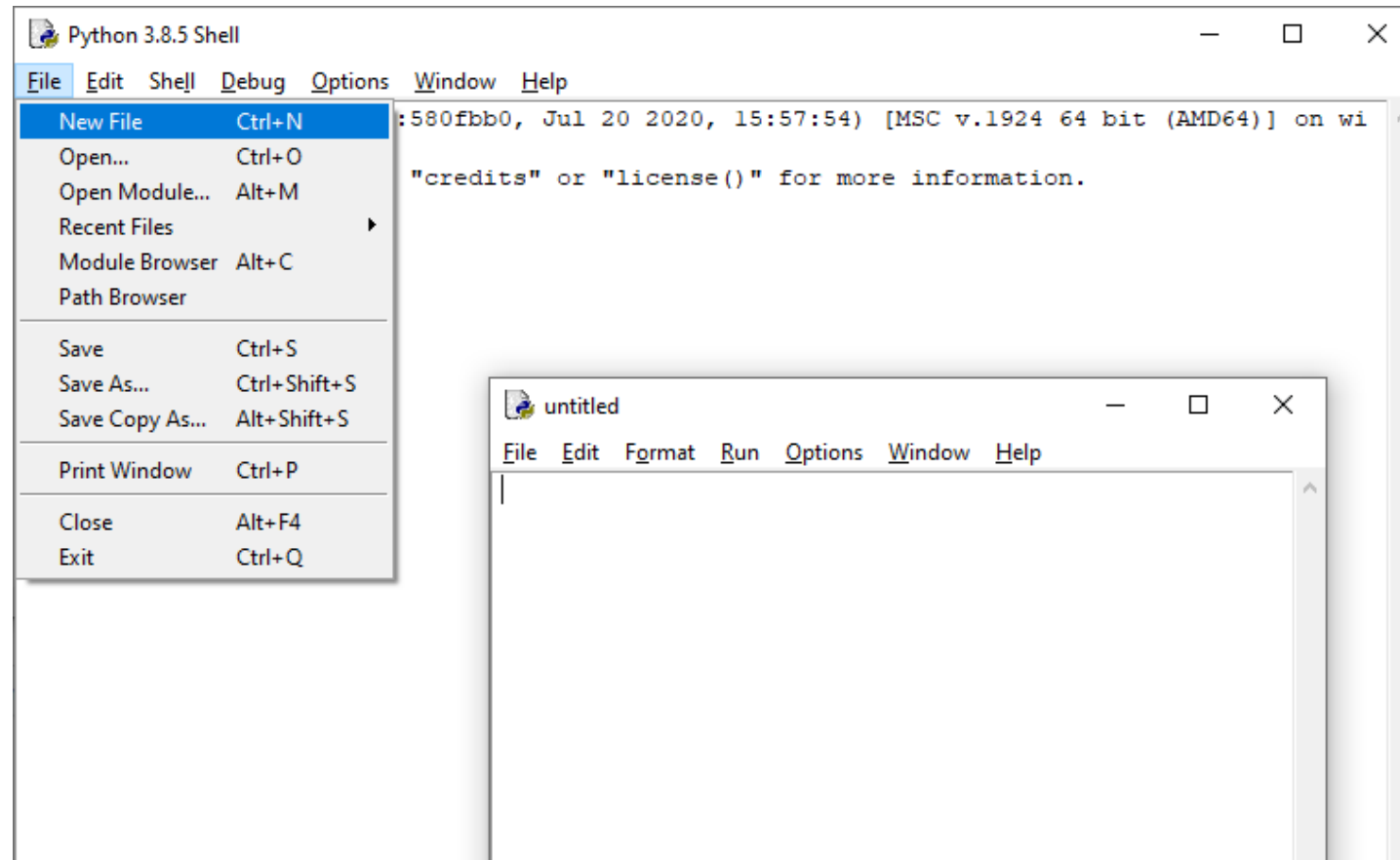
```
Python 3.5.2 Shell
Python 3.5.2 (v3.5.2:4def2a2901a5, Jun 26 2016, 10:47:25)
[GCC 4.2.1 (Apple Inc. build 5666) (dot 3)] on darwin
Type "copyright", "credits" or "license()" for more information.
>>> WARNING: The version of Tcl/Tk (8.5.9) in use may be unstable.
Visit http://www.python.org/download/mac/tcltk/ for current information.

>>> print("Hello World!")
Hello World!
>>> 1 + 1
2
>>> |
```

Ln: 11 Col: 4

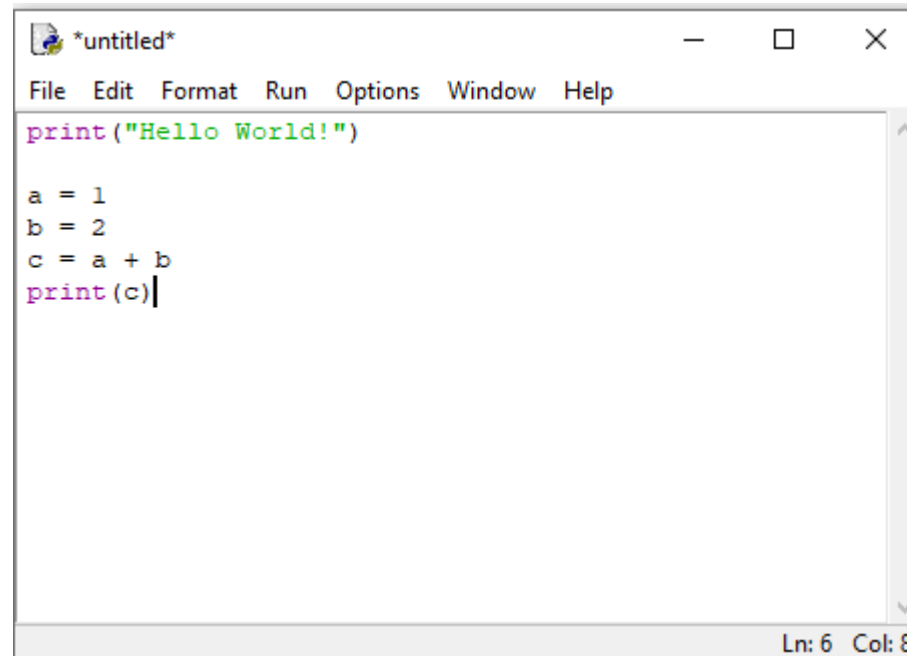
Python - IDLE

Select the menu: *File* > *New File*, a new window will appear



Python - IDLE

Type the following Python code into the new window

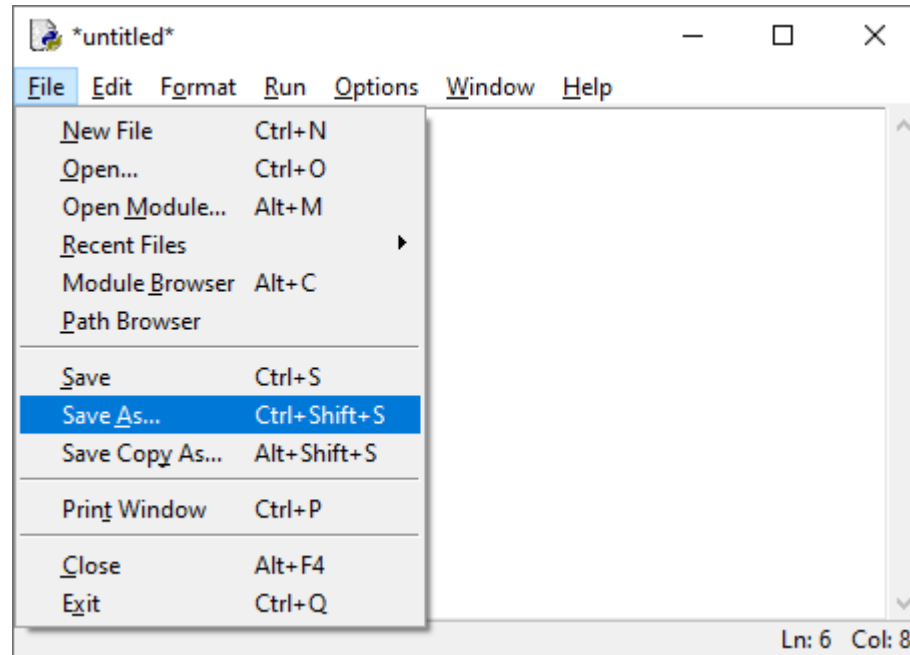


```
*untitled*
File Edit Format Run Options Window Help
print("Hello World!")

a = 1
b = 2
c = a + b
print(c)
Ln: 6 Col: 8
```

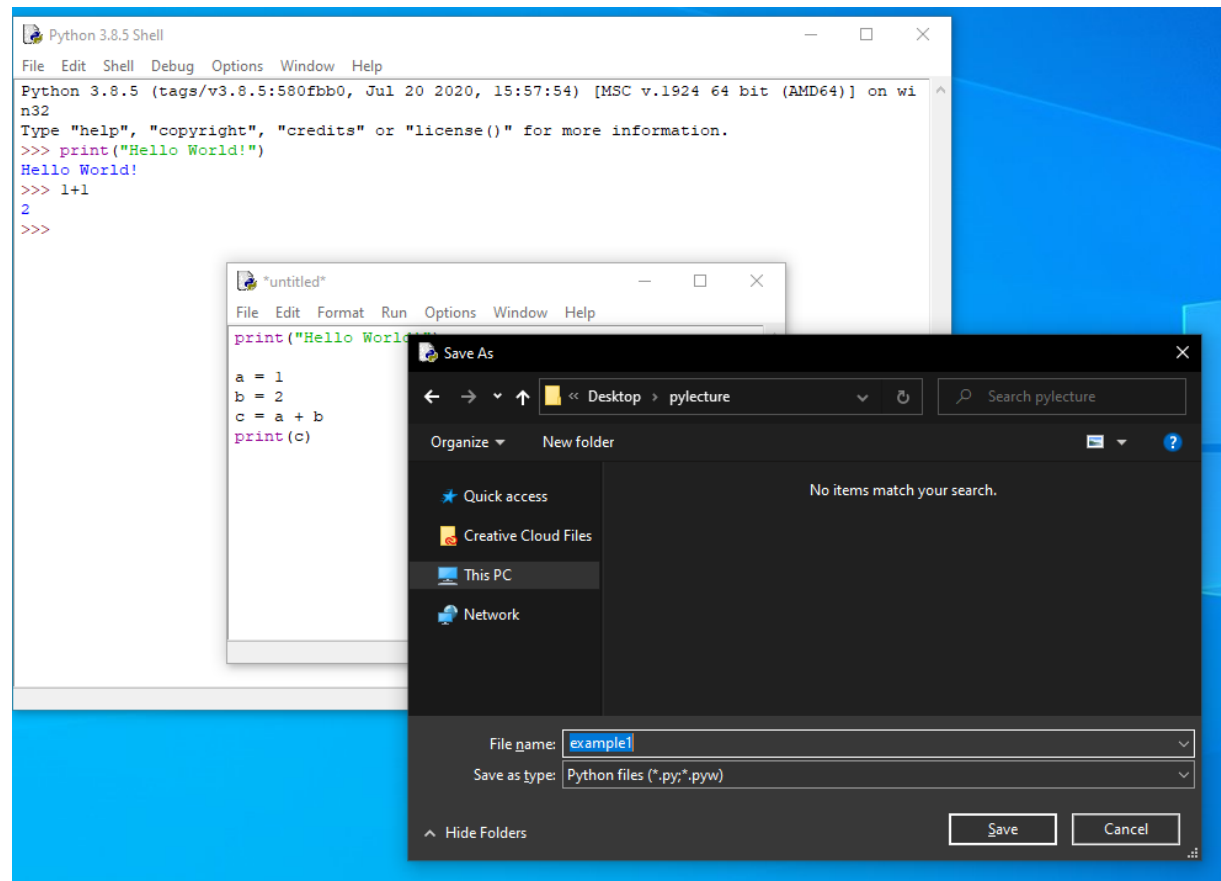
Python - IDLE

Select the menu: *File* > *Save As...*



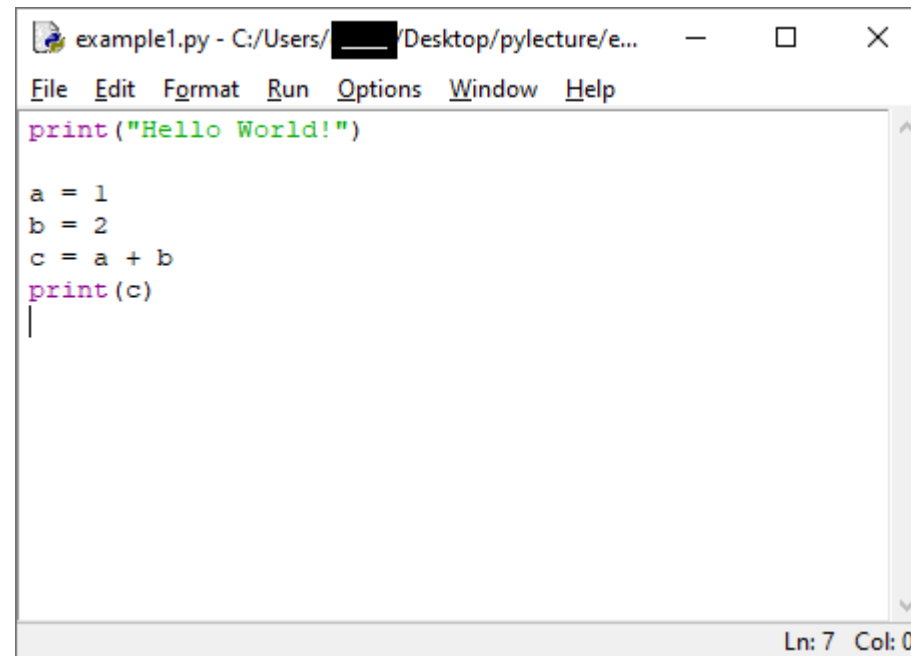
Python - IDLE

I saved the code into a new file called **example1.py**



Python - IDLE

I can see now that my code has been saved to the file **example1.py**

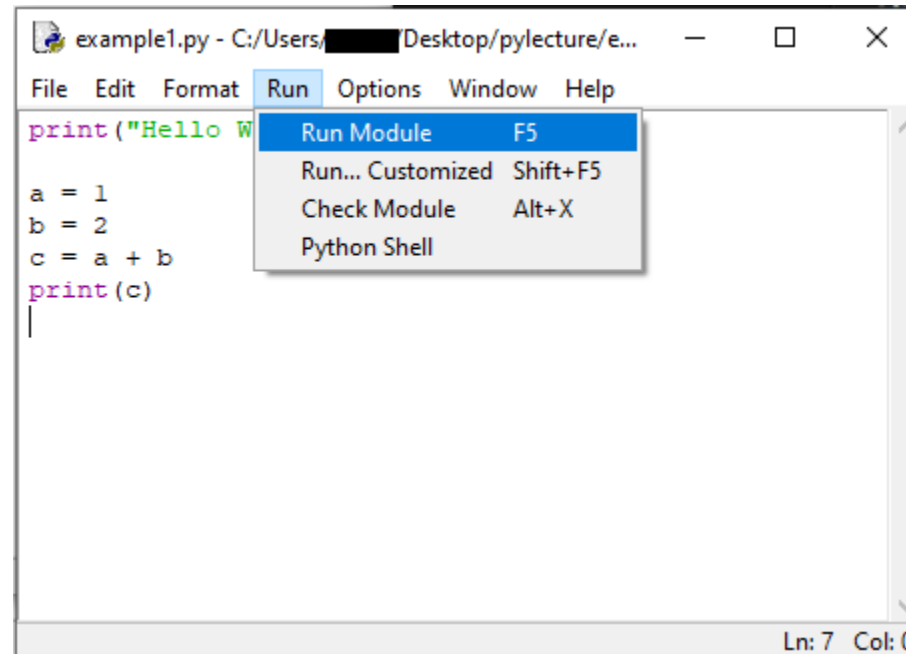
A screenshot of the Python IDLE (Integrated Development and Learning Environment) window. The title bar at the top reads "example1.py - C:/Users/[redacted]/Desktop/pylecture/e...". Below the title bar is a menu bar with the following options: File, Edit, Format, Run, Options, Window, and Help. The main text area contains the following Python code:

```
print("Hello World!")  
  
a = 1  
b = 2  
c = a + b  
print(c)  
|
```

The code is color-coded: "print" is purple, "Hello World!" is green, and the variable names and numbers are black. A vertical scrollbar is on the right side of the text area. At the bottom right of the window, the status bar shows "Ln: 7 Col: 0".

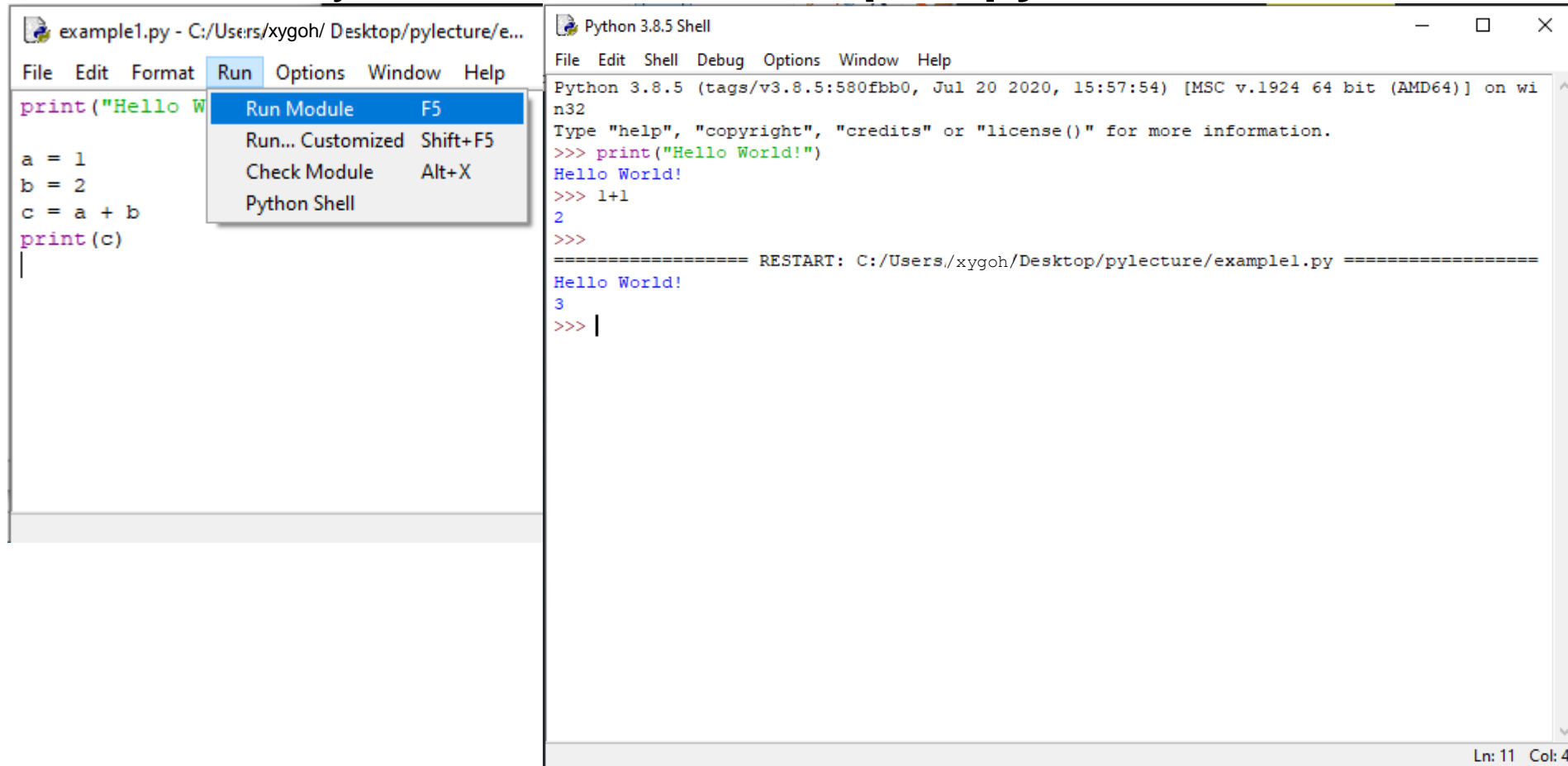
Python - IDLE

Select the menu: **Run** > **Run Module**



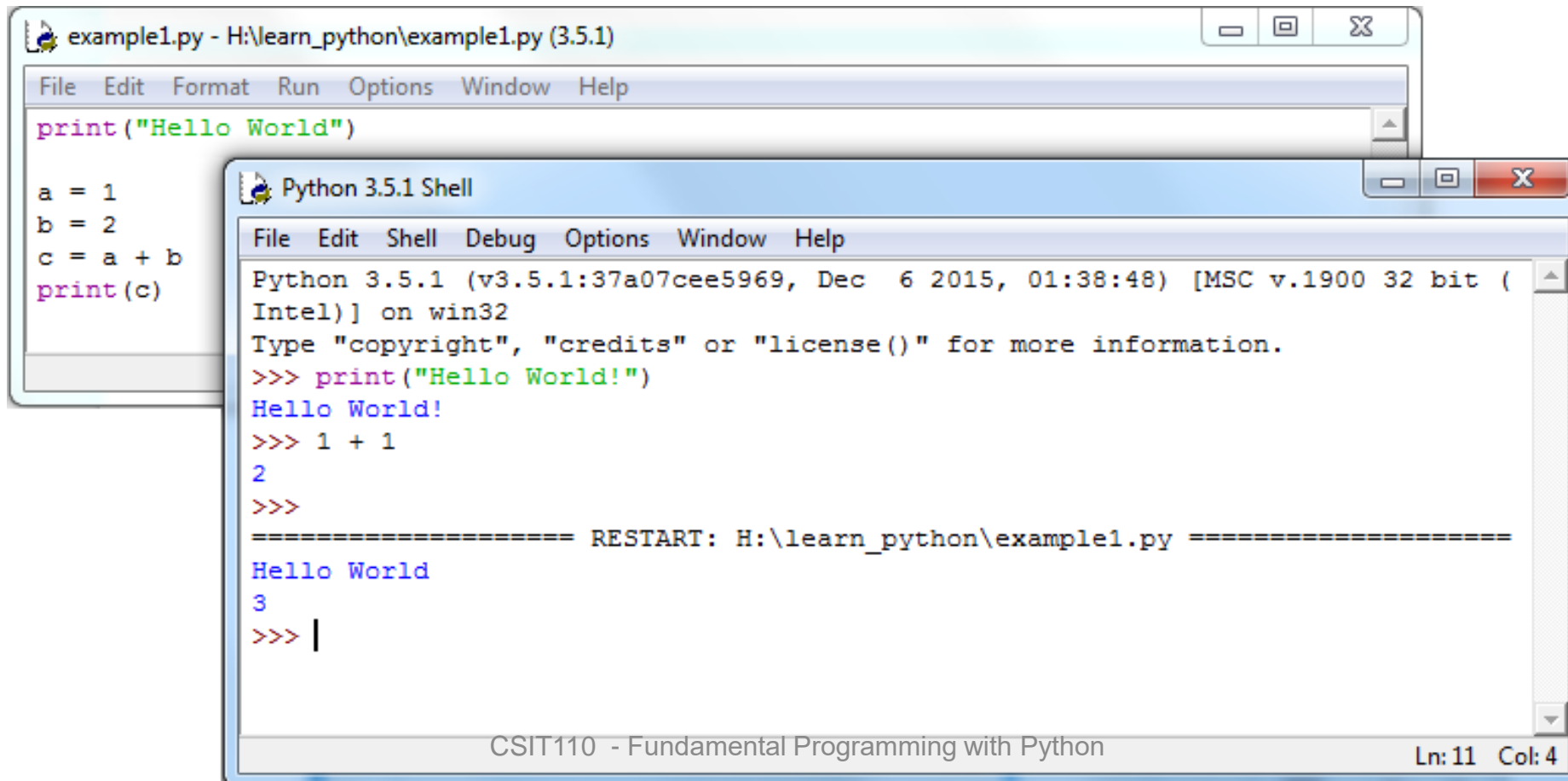
Python - IDLE

I can see that my code in the file **example1.py** works



Python - IDLE

Sequential programming – the instructions are executed after the previous one has completed



The image shows the Python IDLE (Integrated Development and Learning Environment) interface. It consists of two main windows: a script editor and a shell window.

The script editor window, titled "example1.py - H:\learn_python\example1.py (3.5.1)", contains the following Python code:

```
print("Hello World")

a = 1
b = 2
c = a + b
print(c)
```

The Python 3.5.1 Shell window, titled "Python 3.5.1 Shell", shows the execution of the code. It displays the following output:

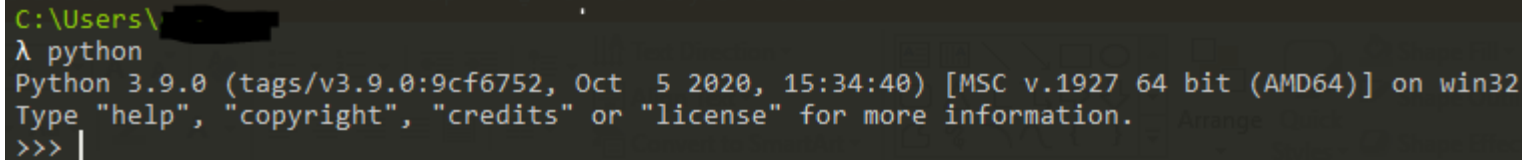
```
Python 3.5.1 (v3.5.1:37a07cee5969, Dec 6 2015, 01:38:48) [MSC v.1900 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> print("Hello World!")
Hello World!
>>> 1 + 1
2
>>>
===== RESTART: H:\learn_python\example1.py =====
Hello World
3
>>> |
```

The bottom status bar of the shell window indicates "CSIT110 - Fundamental Programming with Python" and "Ln: 11 Col: 4".

Running the Python interpreter (Extra)

Using the interpreter on other command line interfaces (CLI)

1. add the path to the python interpreter to your system's environment variable PATH
 - Default location for Windows: C:\Users\<username>\AppData\Local\Programs\Python\Python38-32\python.exe
 - https://opentechschoool.github.io/python-beginners/en/getting_started.html
2. Type 'python' in your terminal or command prompt



```
C:\Users\<username>\> python
Python 3.9.0 (tags/v3.9.0:9cf6752, Oct 5 2020, 15:34:40) [MSC v.1927 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more
>>> |
```

Integrated Development Environment

has

- source code editor
- automation tools
- a debugger
- console/terminal

Examples

- IDLE
- Pycharm
- Eclipse
- Spyder
- Visual Studio Code
- Atom

What if I don't have computer/laptop at home?

What if my computer/laptop cannot install Python?

Online IDE

What if I don't have computer/laptop at home?

What if my computer/laptop cannot install Python?

Use online Python IDEs

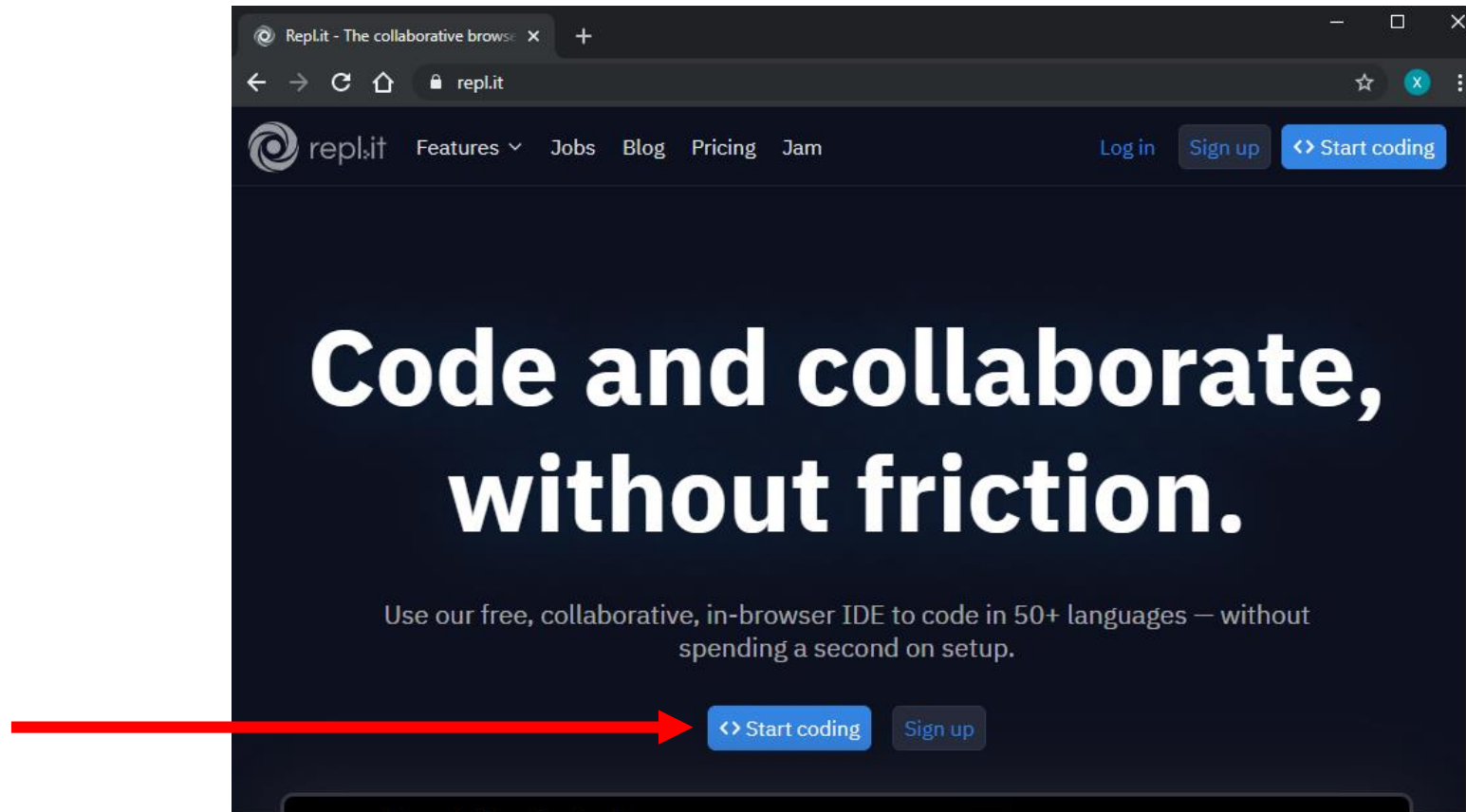
- <http://colab.research.google.com>
- <http://repl.it>
- <http://pythontutor.com>
- <http://techmums.co/python.html>
- https://www.tutorialspoint.com/execute_python3_online.php
- [Google search for it](#)

Online IDE - <http://repl.it>

Enter site -> '<> start coding' -> 'Python' -> 'create repl'

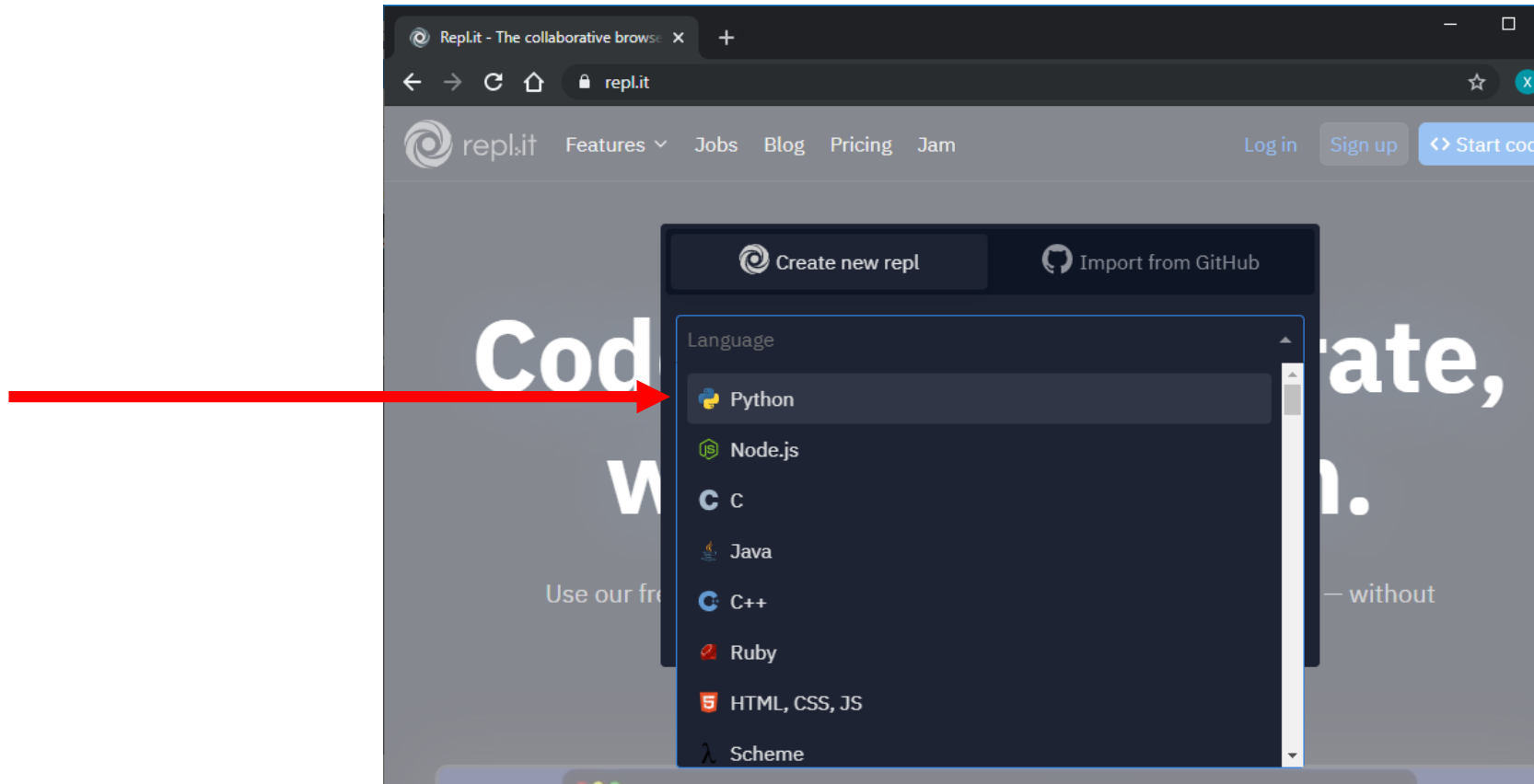
Online IDE - <http://repl.it>

Enter site -> '<>' start coding



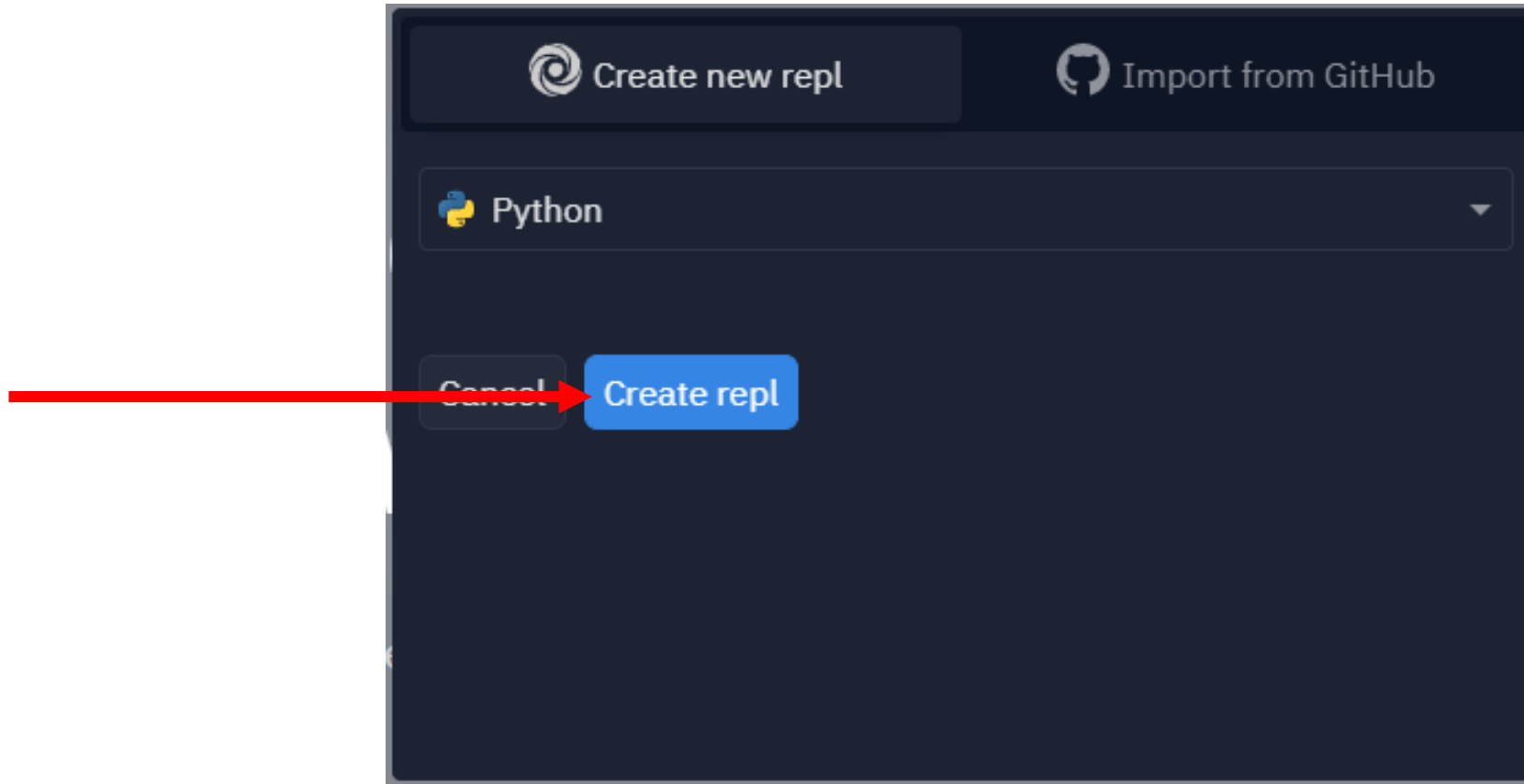
Online IDE - <http://repl.it>

Enter site -> '<> start coding'-> 'Python'

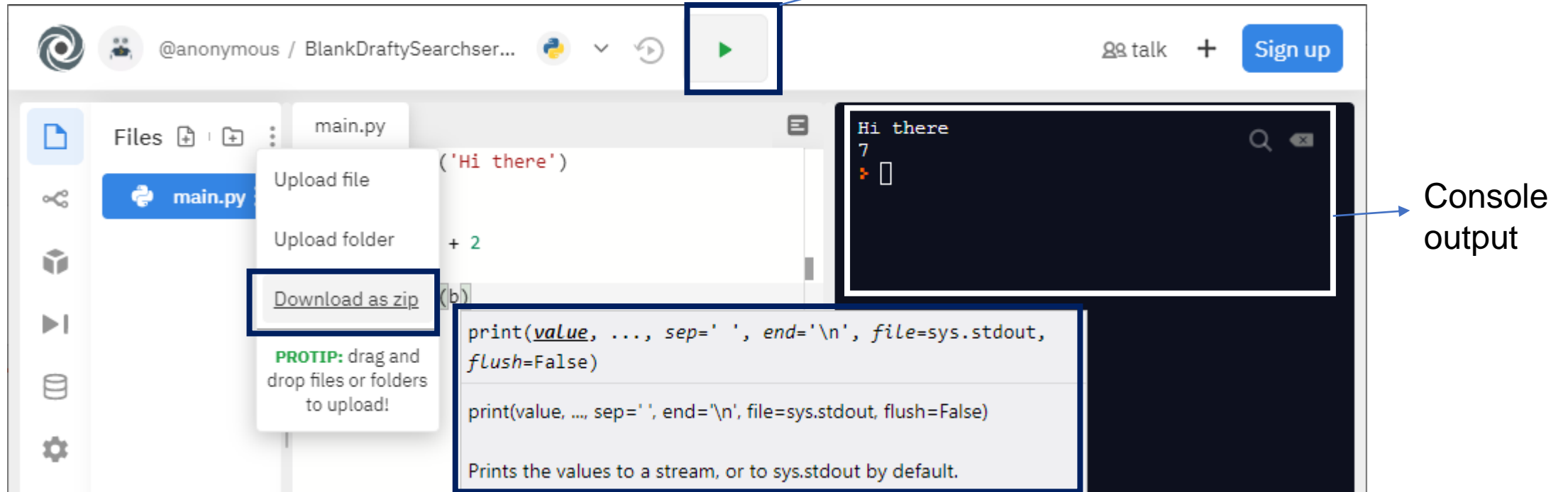


Online IDE - <http://repl.it>

Enter site -> '<> start coding'-> 'Python' -> 'create repl'



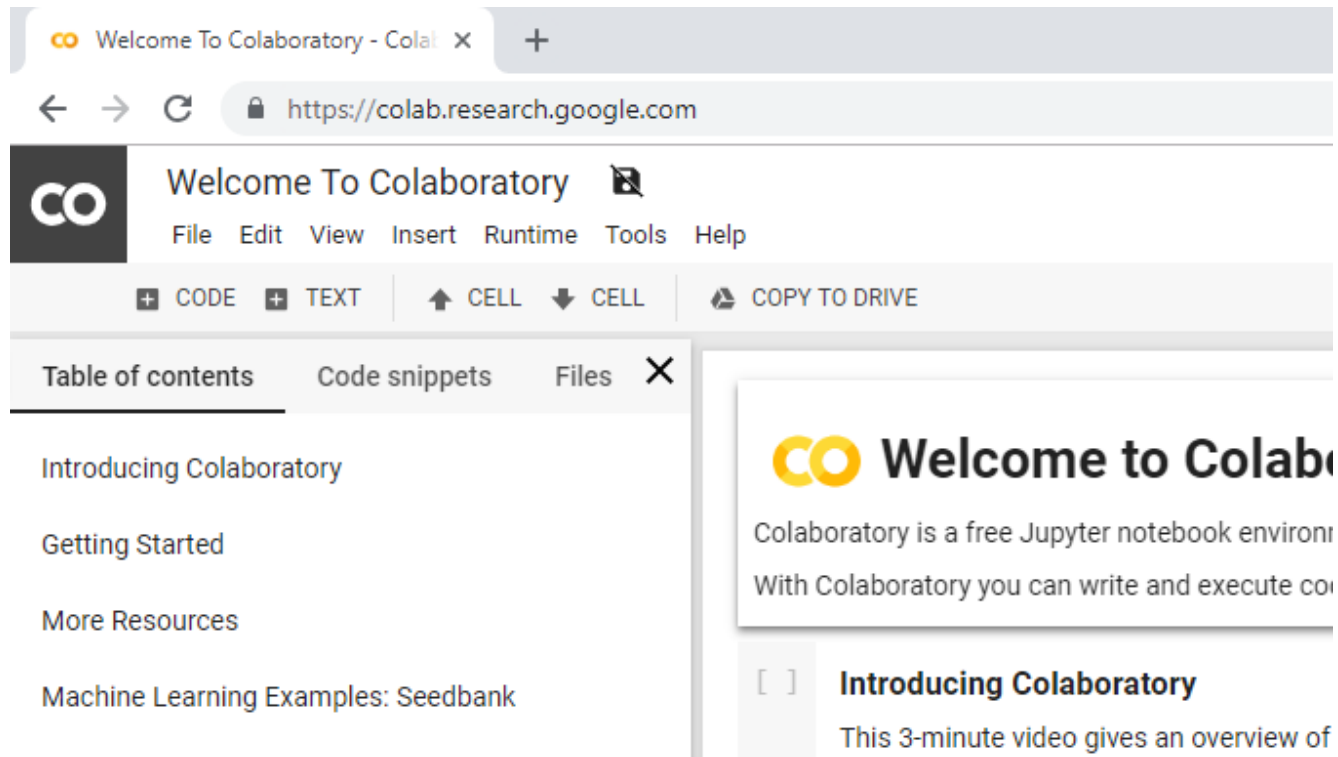
Online IDE - <http://repl.it>



It is important to check the Python Version. Some online IDE run Python version 2. **In this subject, we use Python version 3.**

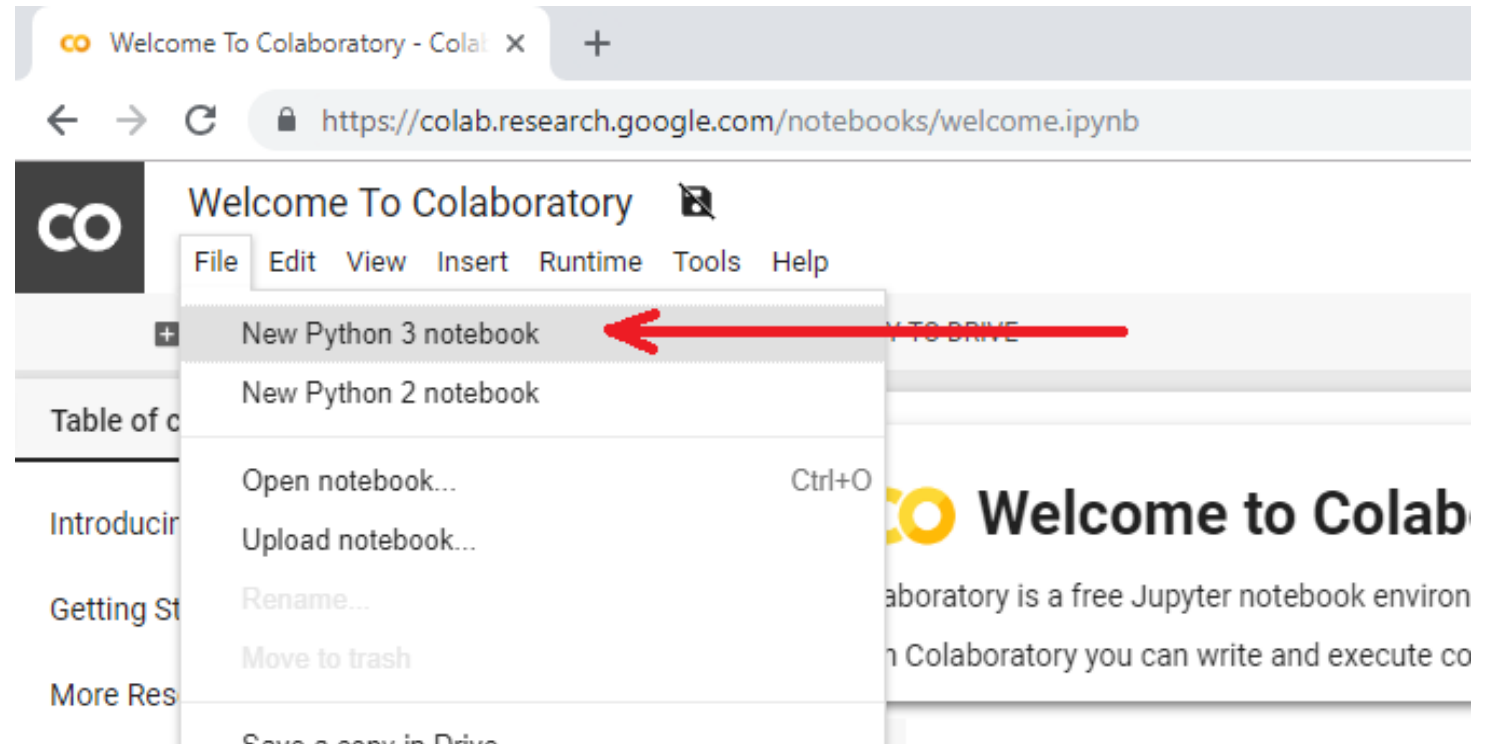
Online IDE – Google Colab

- <https://colab.research.google.com>
- All work can be saved on Google Drive



Online IDE – Google Colab

- <https://colab.research.google.com>
- All work can be saved on Google Drive
- To run new Python 3 file



Online IDE – Google Colab

- <https://colab.research.google.com>
- All work can be saved on Google Drive



Online IDE – Google Colab

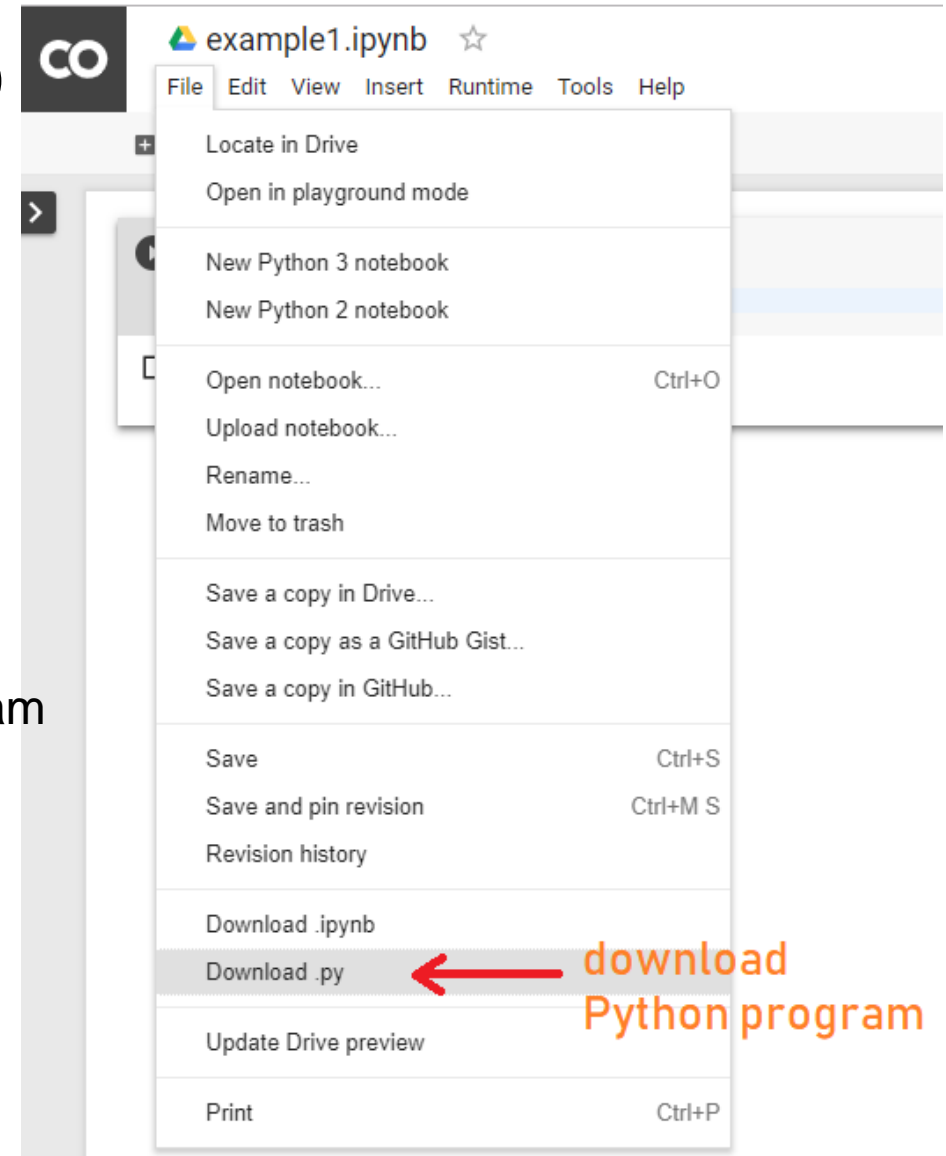
- <https://colab.research.google.com>
- All work can be saved on Google Drive
- Uses Jupyter Notebook style IDE



Online IDE – Google Colab

- <https://colab.research.google.com>
- All work can be saved on Google Drive
- Uses Jupyter Notebook style IDE

Download Python program



Online resources

- There are many online tutorials on Python
- Try Google search or YouTube search on “python tutorial”
- Here are some useful links:
 - <http://www.python.org/about/gettingstarted>
 - <http://docs.python.org/3/>
 - <http://wiki.python.org/moin/BeginnersGuide/Programmers>
 - <http://www.tutorialspoint.com/python3>
 - <https://docs.python.org/3.8/tutorial/index.html>

Beginner's Guide

The screenshot shows the Python.org website. The navigation bar includes links for Python, PSF, Docs, PyPI, Jobs, and Community. Below this is a secondary navigation bar with links for About, Downloads, Documentation, Community, Success Stories, News, and Events. The main content area features a code snippet for a Fibonacci series, a section titled "Functions Defined" explaining the core of extensible programming, and a footer with four columns: "Get Started" (highlighted with a blue arrow), "Download", "Docs", and "Jobs". The "Get Started" column contains a link to "Start with our Beginner's Guide".

python.org

Python PSF Docs PyPI Jobs Community

python™

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About Downloads Documentation Community Success Stories News Events

```
# Python 3: Fibonacci series up to n
>>> def fib(n):
>>>     a, b = 0, 1
>>>     while a < n:
>>>         print(a, end=' ')
>>>         a, b = b, a+b
>>>     print()
>>> fib(1000)
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987
```

Functions Defined

The core of extensible programming is defining functions. Python allows mandatory and optional arguments, keyword arguments, and even arbitrary argument lists. [More about defining functions in Python 3](#)

1 2 3 4 5

Python is a programming language that lets you work quickly and integrate systems more effectively. [>>> Learn More](#)

Get Started
Whether you're new to programming or an experienced developer, it's easy to learn and use Python.
[Start with our Beginner's Guide](#)

Download
Python source code and installers are available for download for all versions!
Latest: Python 3.8.5

Docs
Documentation for Python's standard library, along with tutorials and guides, are available online.
[docs.python.org](#)

Jobs
Looking for work or have a Python related position that you're trying to hire for? Our **relaunched community-run job board** is the place to go.
[jobs.python.org](#)

Latest News [>>> More](#) **Upcoming Events** [>>> More](#)

Finally,

- good programming skill - needs a lot of practice!
- so install **Python** and start coding as soon as possible