

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

...

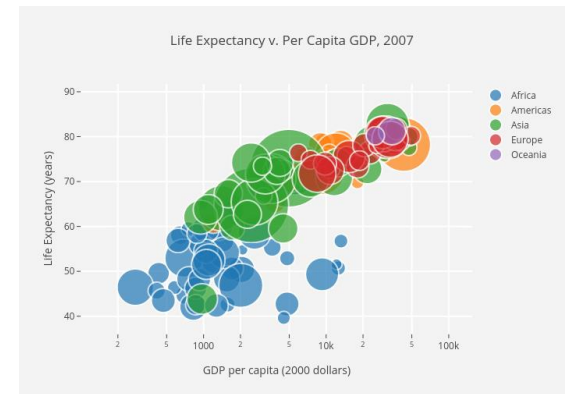
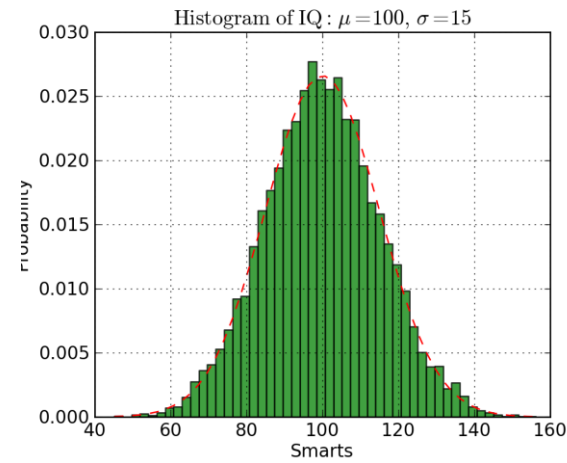
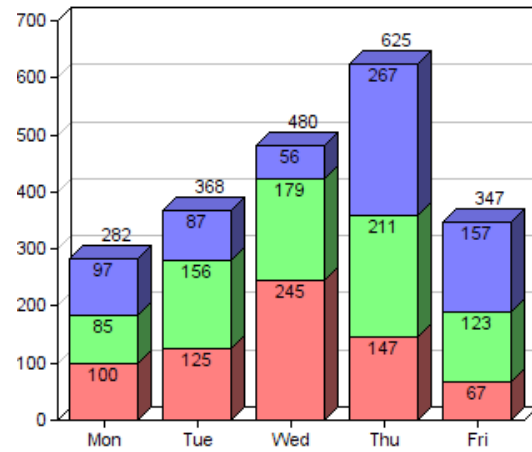
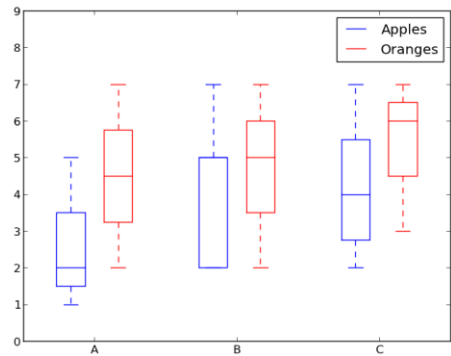
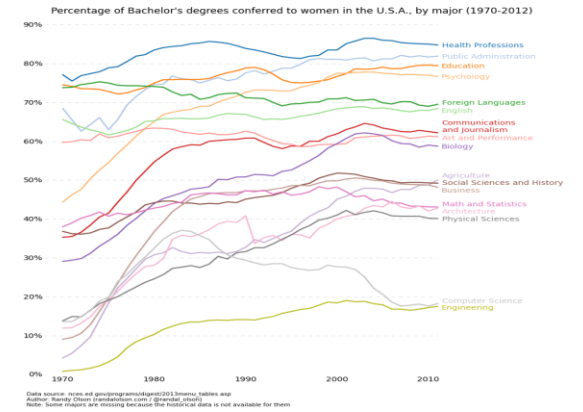
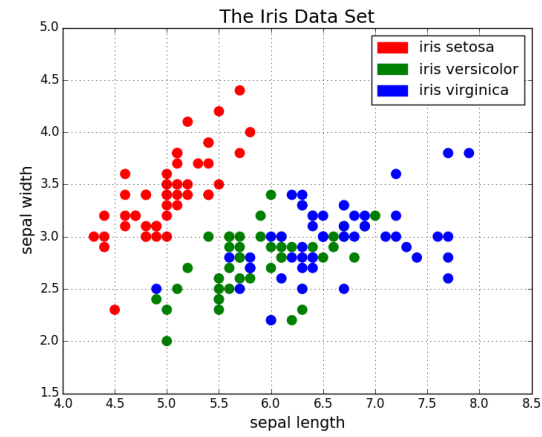
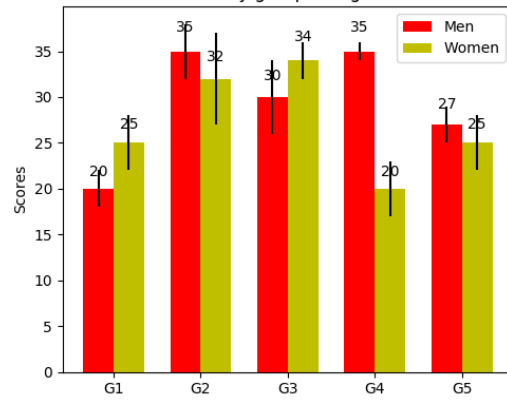
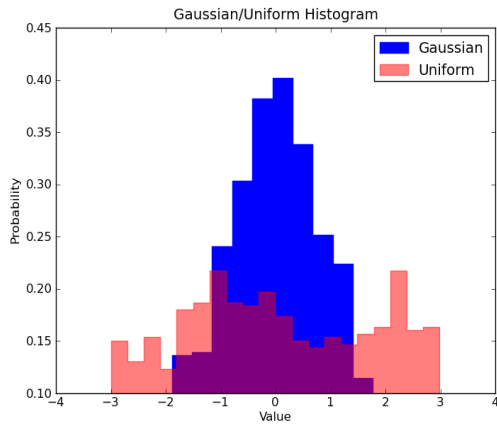


Image source: <https://towardsdatascience.com/5-quick-and-easy-data-visualizations-in-python-with-code-a2284bae952f>



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/>



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



Learning Objectives

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

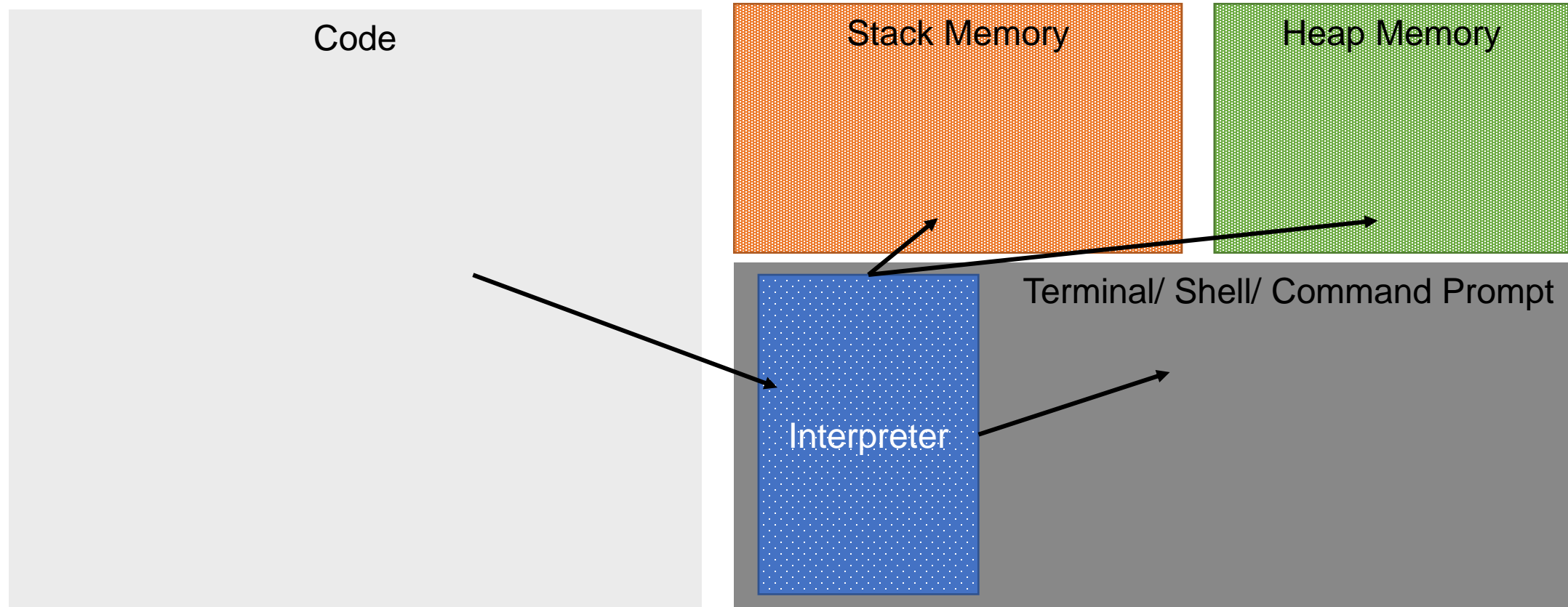
Course Information

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

What do I need?

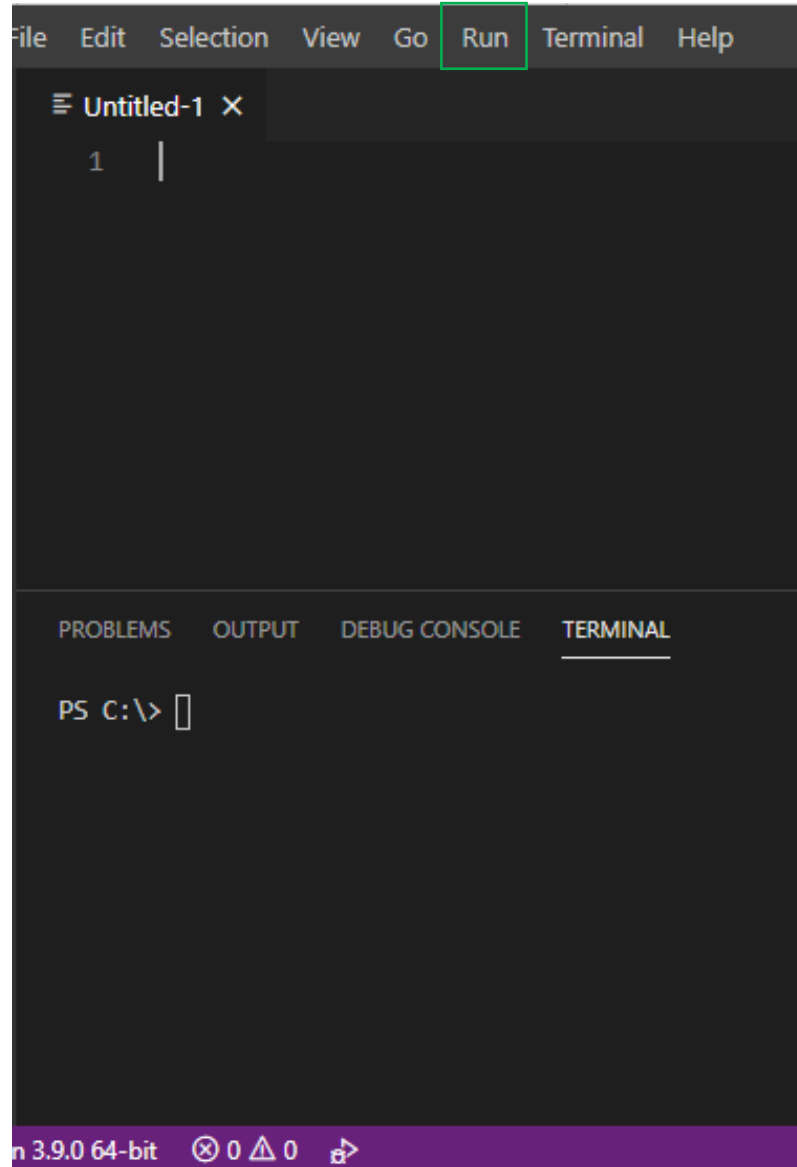
- Python interpreter
- Code editor

Components



In the slides,

Interpreter



Text in the grey boxes are code

text in the boxes are what you will see in the terminal

Integrated Development Environment

has

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


Examples

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

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

https://www.python.org

Python PSF Docs PyPI Jobs

 python™

Search GO

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```
# 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

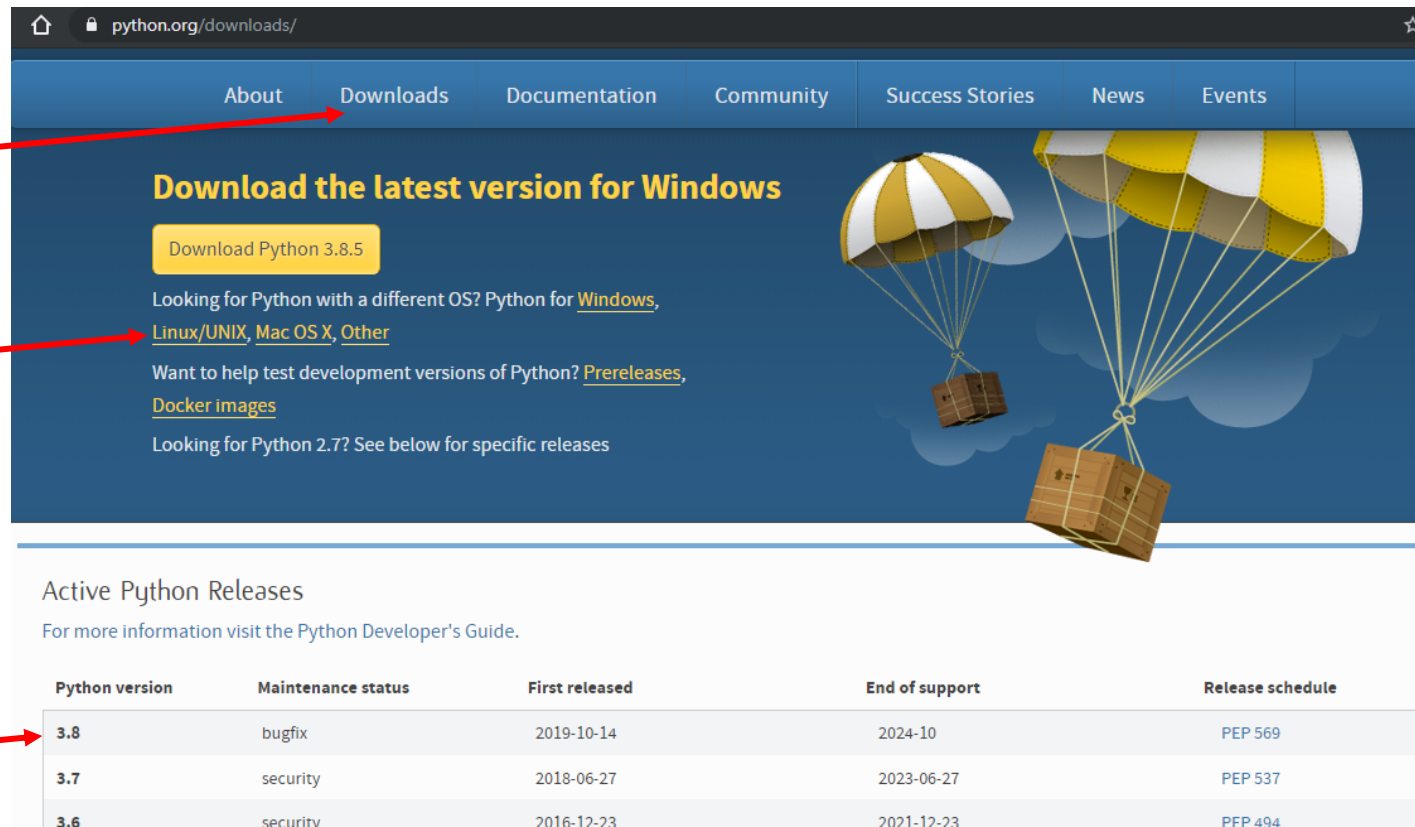
Python software foundation website: <http://www.python.org>

Useful resources available on this website:

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

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" version in the table.

Download the latest version for Windows

[Download Python 3.8.5](#)

Looking for Python with a different OS? Python for [Windows](#), [Linux/UNIX](#), [Mac OS X](#), [Other](#)

Want to help test development versions of Python? [Prereleases](#), [Docker images](#)

Looking for Python 2.7? See below for specific releases

Active Python Releases

For more information visit the [Python Developer's Guide](#).

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

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

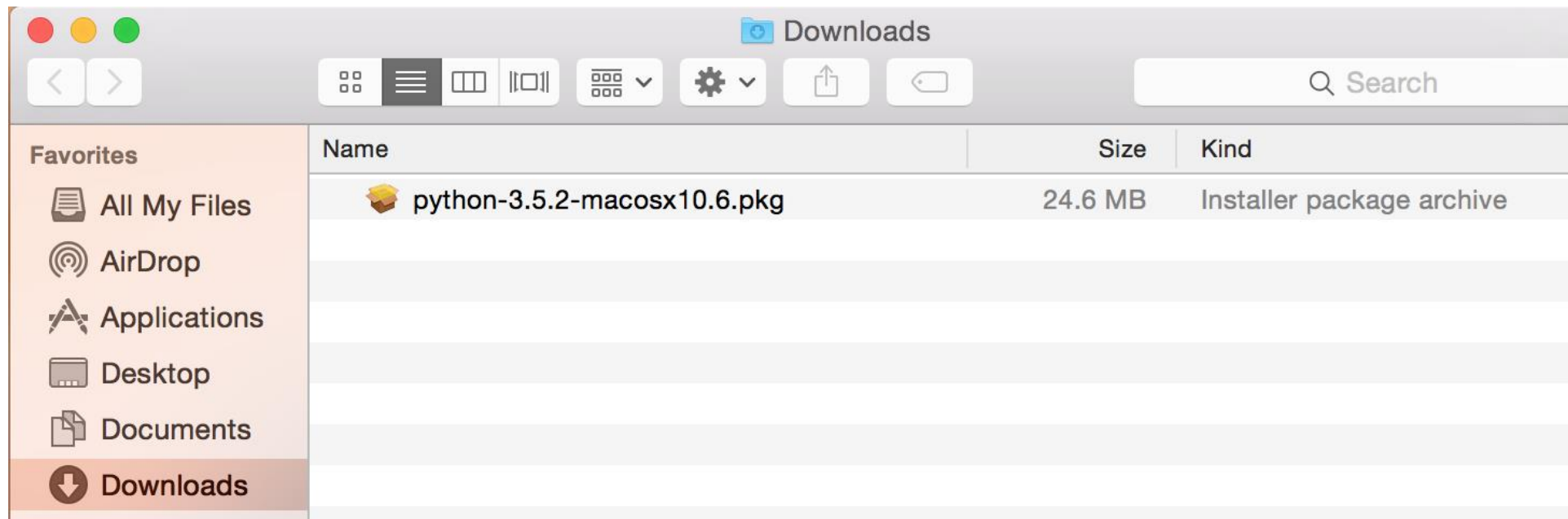
- <http://colab.research.google.com>
- <http://repl.it>
- <http://pythontutor.com>
- <http://techmums.co/python.html>
- https://www.tutorialspoint.com/execute_python3_online.php
- [Google search for it](#)
- <https://vscode.dev/>

Python installation for Windows

Installation - Mac

Run the download Python package

And follow the instructions in the installation wizard



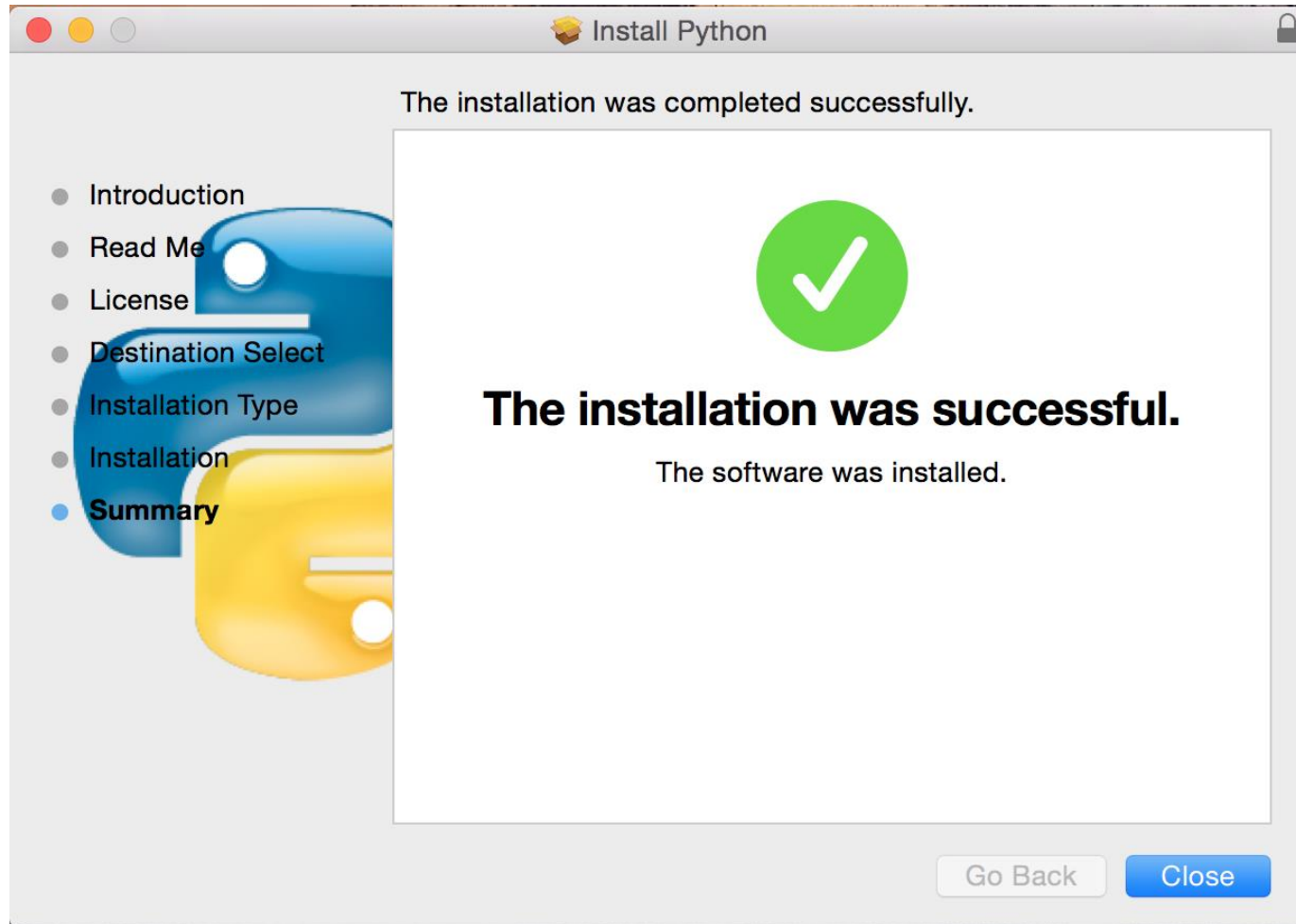
Installation - Windows

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

Installation



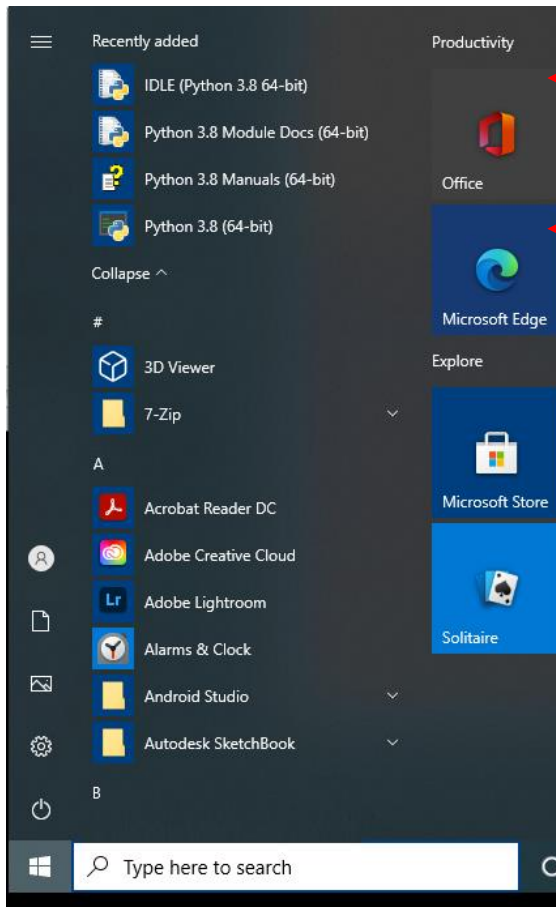
Installation



Installation - success

Windows

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

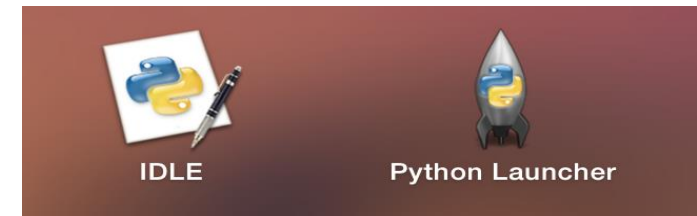


Python IDLE

Python launcher

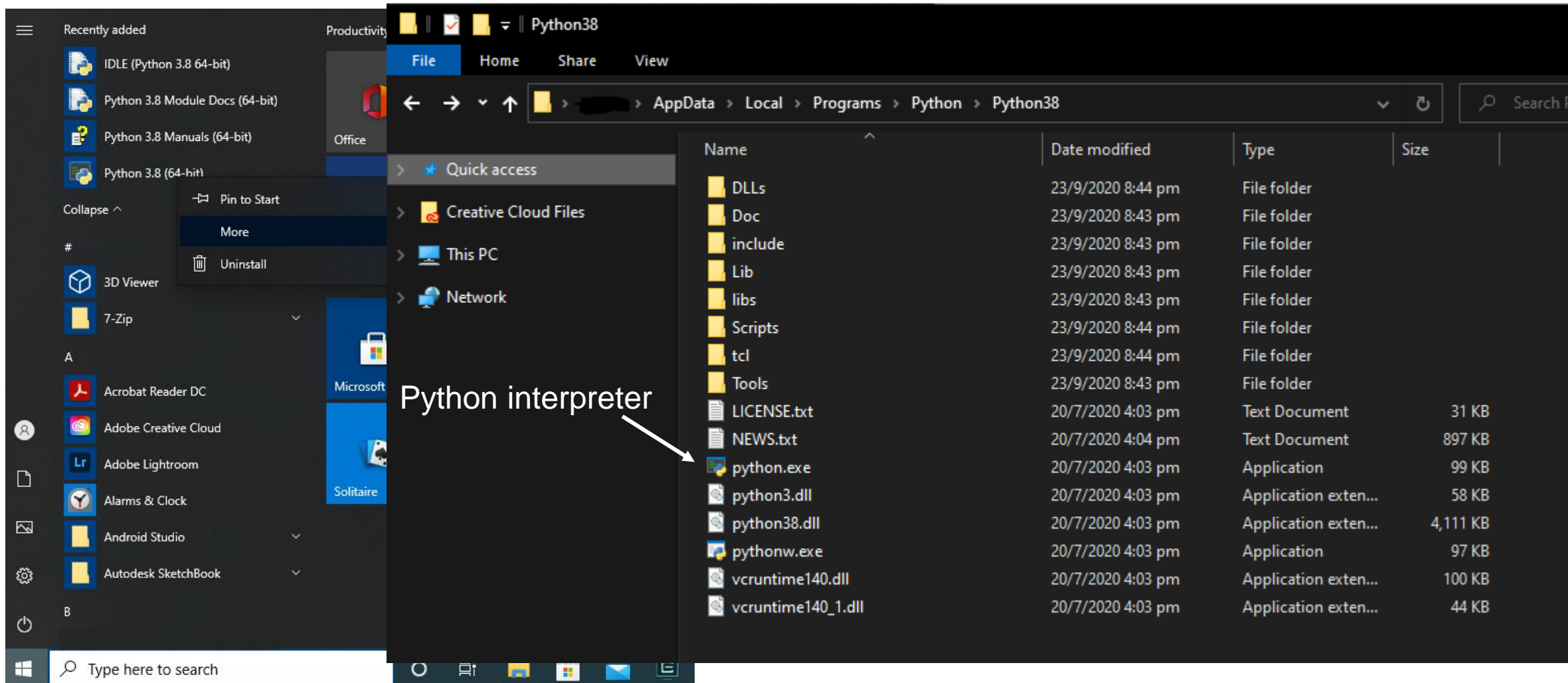
Mac

On the launch pad



Installation - Windows

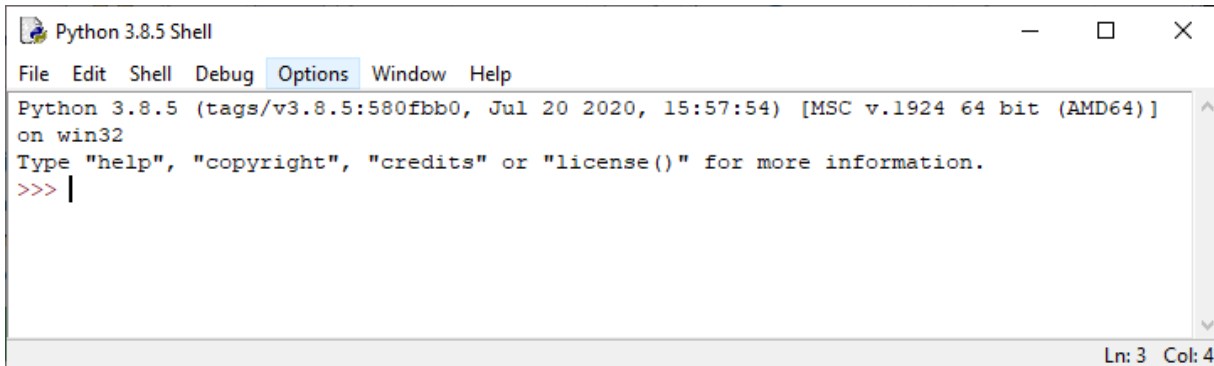
After installation you can see the python application where it is installed



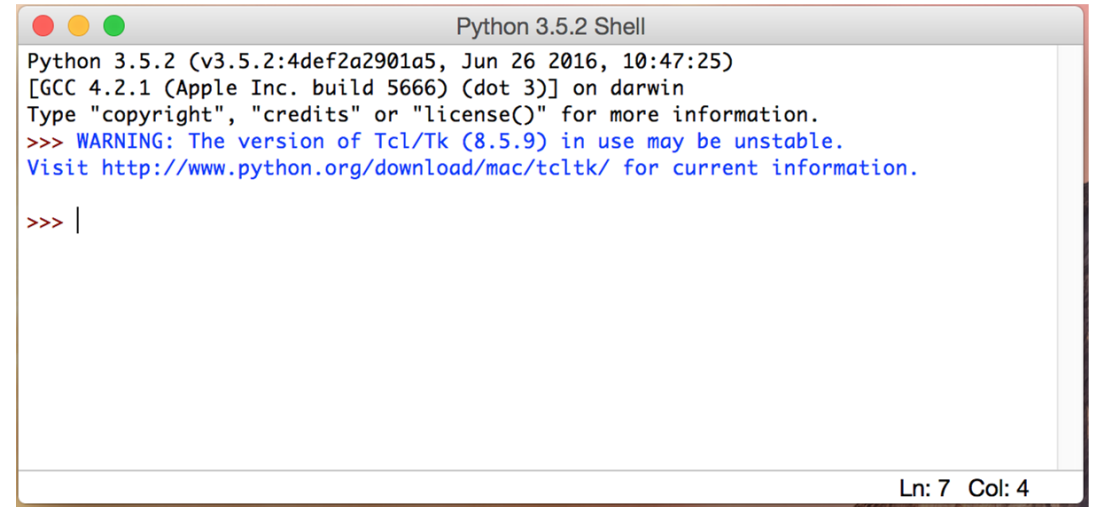
Python IDLE

IDLE

Click on the Python IDLE icon on the start menu,
a new window will appear. This will launch the interpreter in a shell

A screenshot of the Python 3.8.5 Shell window. The window has a title bar that says "Python 3.8.5 Shell" and standard Windows window controls. Below the title bar is a menu bar with "File", "Edit", "Shell", "Debug", "Options", "Window", and "Help". The main text area contains the following text: "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.", and a prompt ">>> |". The status bar at the bottom right shows "Ln: 3 Col: 4".

```
Python 3.8.5 Shell
File Edit Shell Debug Options Window Help
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.
>>> |
Ln: 3 Col: 4
```

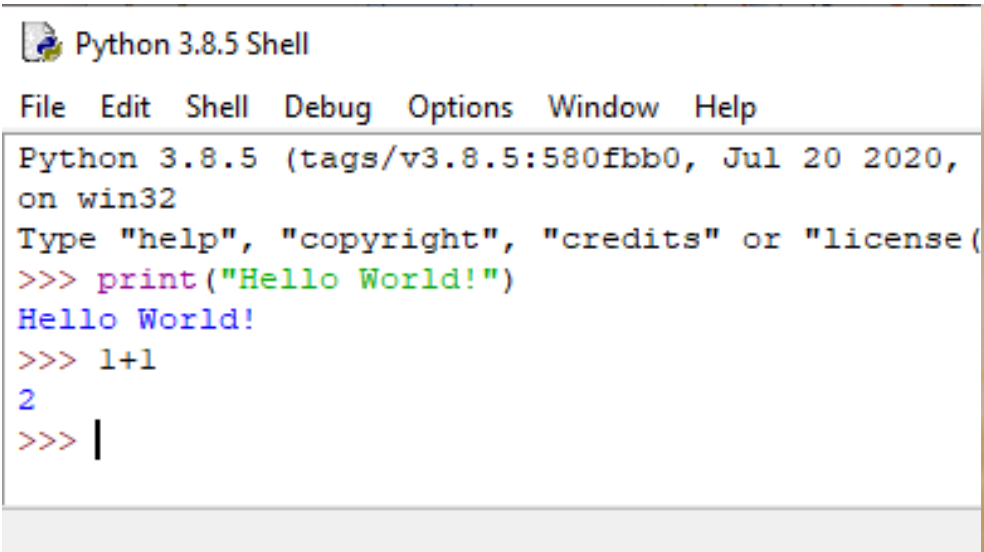
A screenshot of the Python 3.5.2 Shell window. The window has a title bar that says "Python 3.5.2 Shell" and standard macOS window controls. The main text area contains the following text: "Python 3.5.2 (v3.5.2:4def2a2901a5, Jun 26 2016, 10:47:25)", "[GCC 4.2.1 (Apple Inc. build 5666) (dot 3)] on darwin", "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.", and a prompt ">>> |". The status bar at the bottom right shows "Ln: 7 Col: 4".

```
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.
>>> |
Ln: 7 Col: 4
```

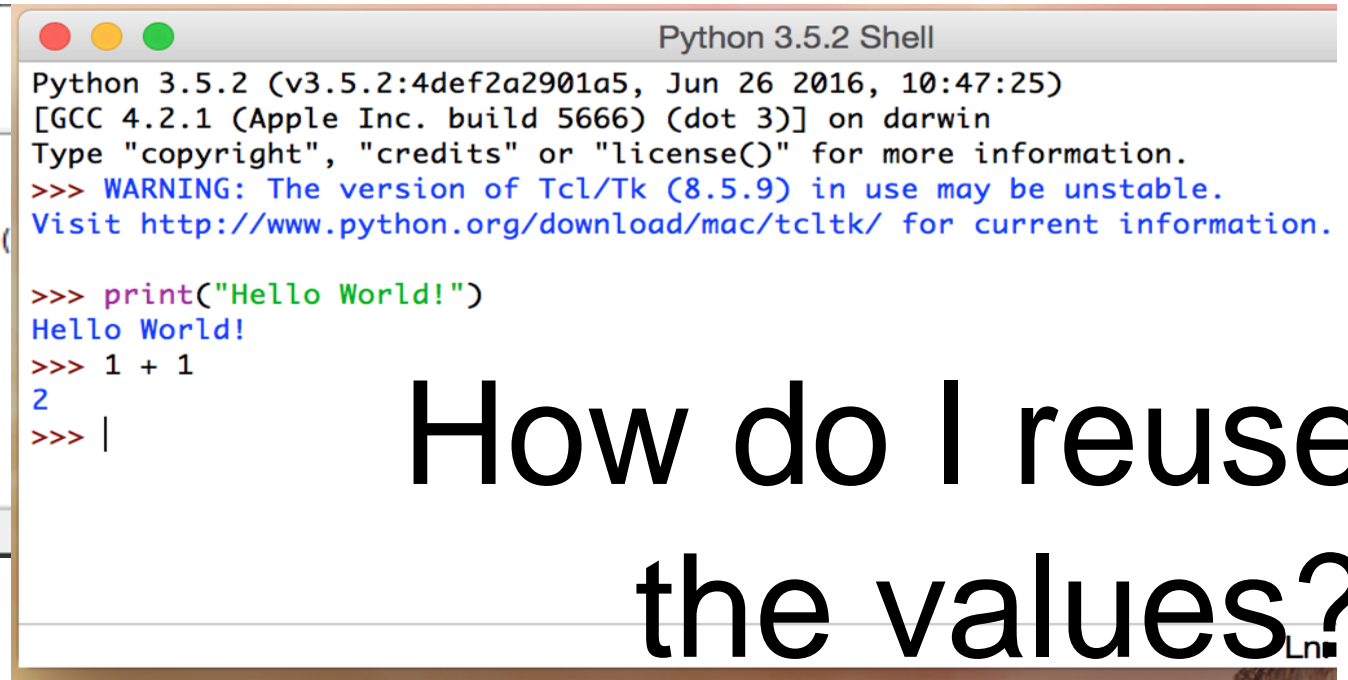
IDLE

Type the following Python code into the IDLE

```
>>>print("Hello world!")  
>>>1+1
```

A screenshot of a Python 3.8.5 Shell window. The title bar says "Python 3.8.5 Shell". The menu bar includes "File", "Edit", "Shell", "Debug", "Options", "Window", and "Help". The text area shows the following content:

```
Python 3.8.5 (tags/v3.8.5:580fbb0, Jul 20 2020,  
on win32  
Type "help", "copyright", "credits" or "license"  
>>> print("Hello World!")  
Hello World!  
>>> 1+1  
2  
>>> |
```

A screenshot of a Python 3.5.2 Shell window. The title bar says "Python 3.5.2 Shell". The text area shows the following content:

```
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  
>>> |
```

How do I reuse
the values?

Variables

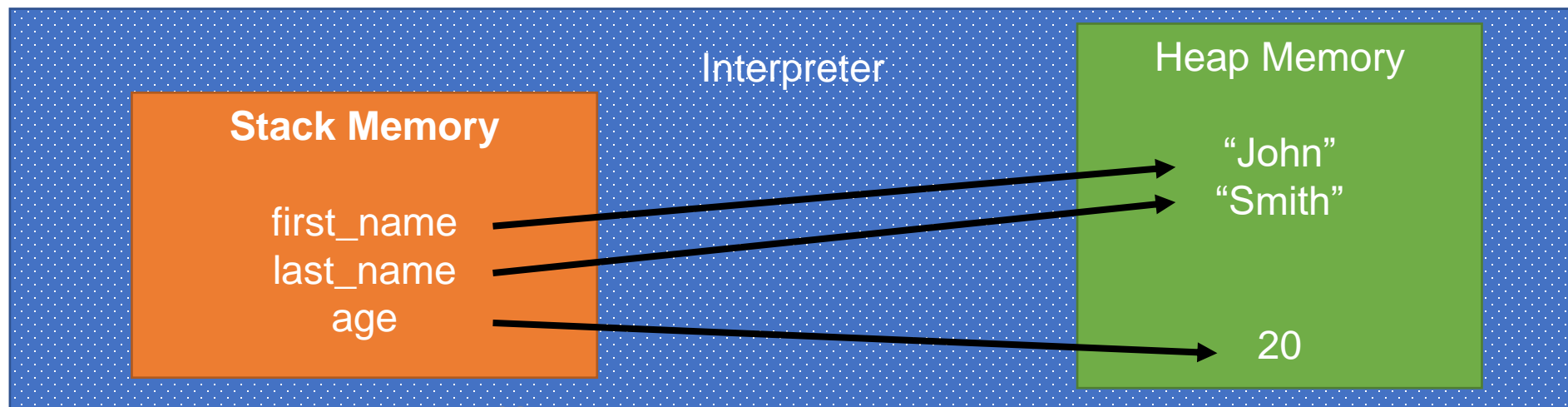
We **instantiate** variables and assign values to the variables

1. Variable name

```
first_name = "John"  
last_name = "Smith"  
age = 20
```

2. Assignment operator

3. Values/ objects



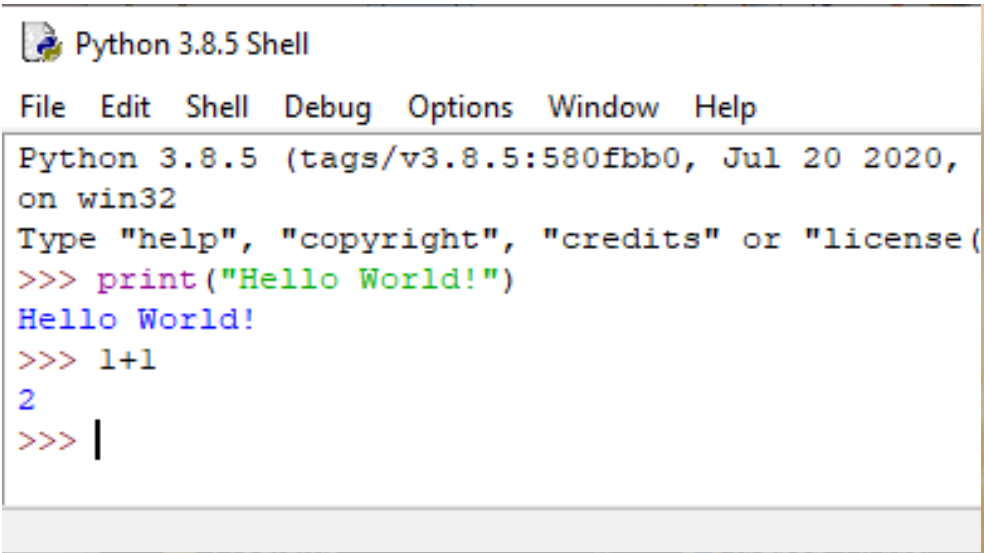
Attributes

- Variables
- Functions
- Classes

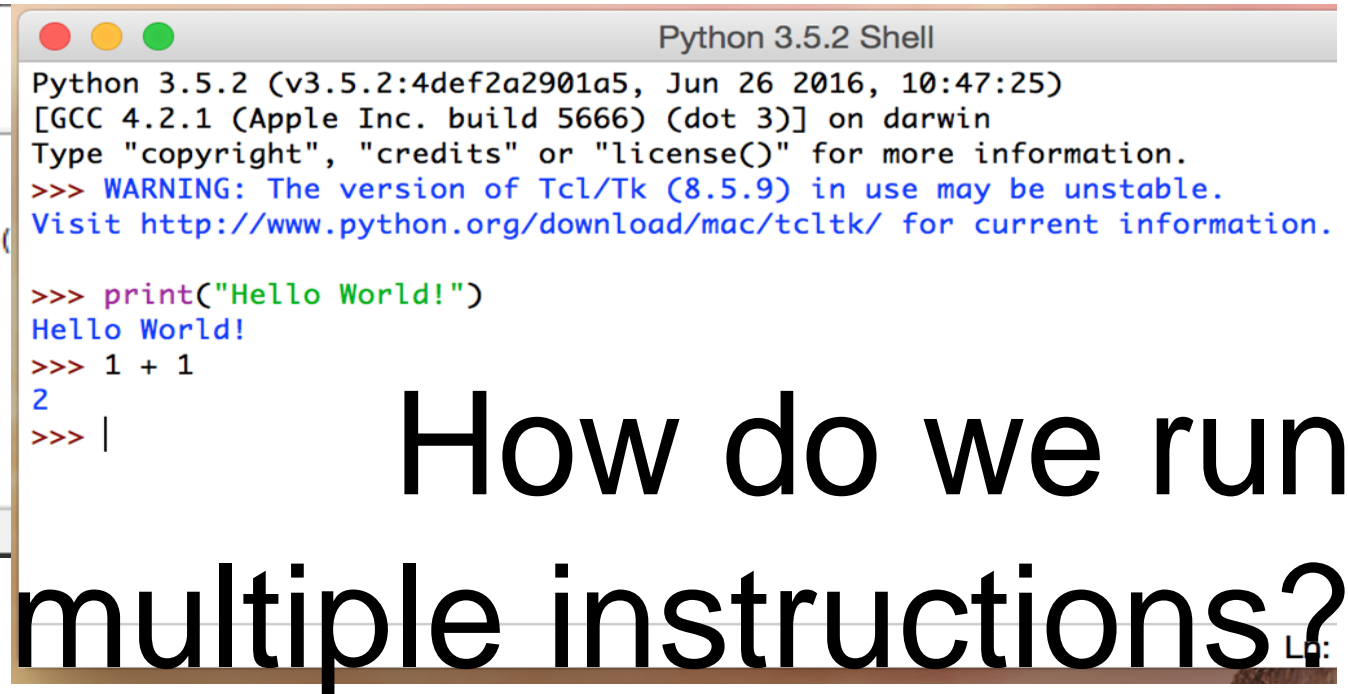
IDLE

Type the following Python code into the IDLE

```
>>>print("Hello world!")  
>>>1+1
```

A screenshot of a Python 3.8.5 Shell window. The title bar says "Python 3.8.5 Shell". The menu bar includes "File", "Edit", "Shell", "Debug", "Options", "Window", and "Help". The text area shows the following content:

```
Python 3.8.5 (tags/v3.8.5:580fbb0, Jul 20 2020,  
on win32  
Type "help", "copyright", "credits" or "license"  
>>> print("Hello World!")  
Hello World!  
>>> 1+1  
2  
>>> |
```

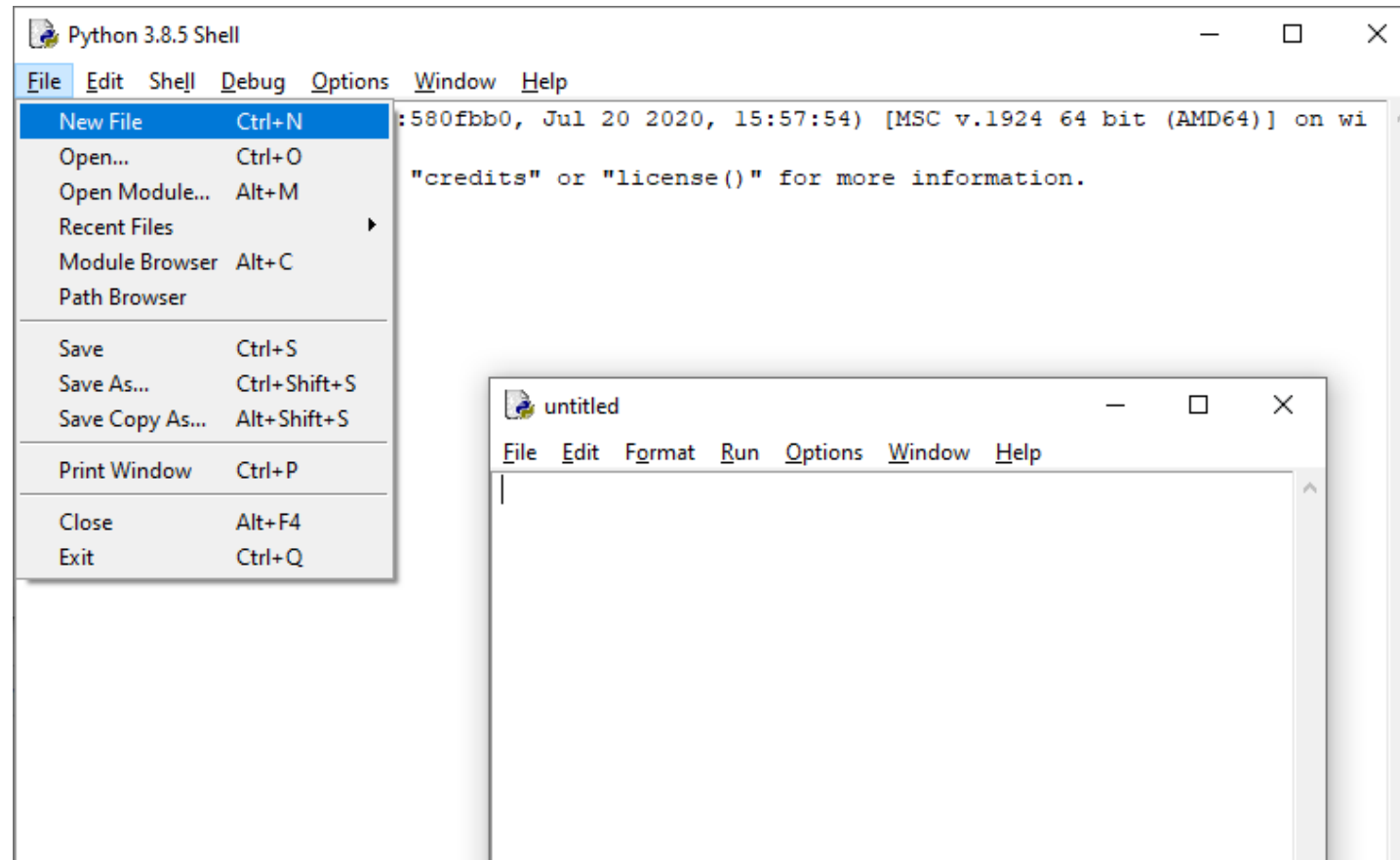
A screenshot of a Python 3.5.2 Shell window. The title bar says "Python 3.5.2 Shell". The text area shows the following content:

```
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  
>>> |
```

How do we run
multiple instructions?

Python – Creating a Python file

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



Python – Editing a Python file

Type the following Python code into the new window



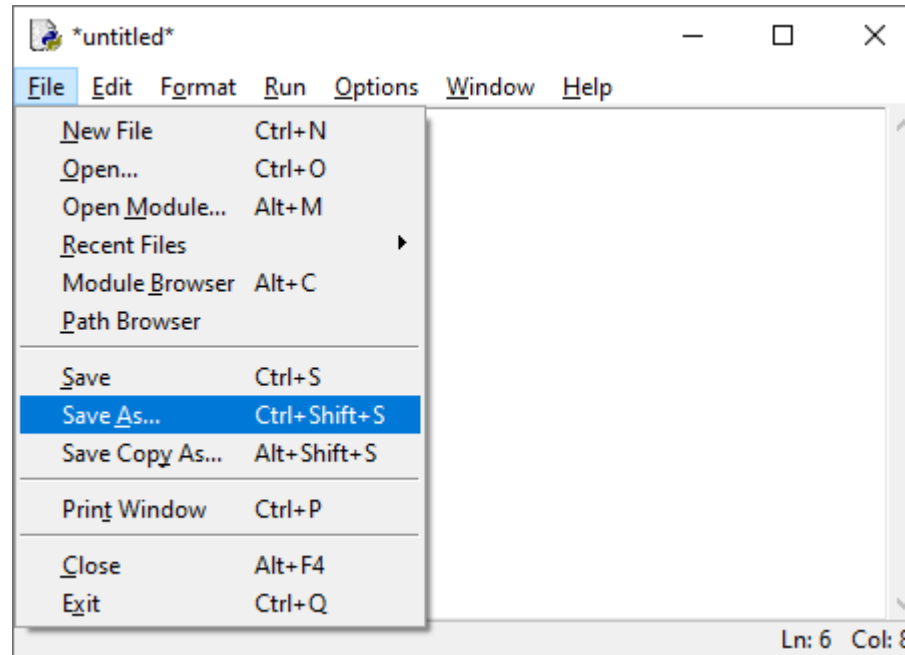
The image shows a screenshot of a Python IDE window titled '*untitled*'. The window has a menu bar with 'File', 'Edit', 'Format', 'Run', 'Options', 'Window', and 'Help'. The code editor contains the following Python code:

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

The cursor is at the end of the last line. The status bar at the bottom right indicates 'Ln: 6 Col: 8'.

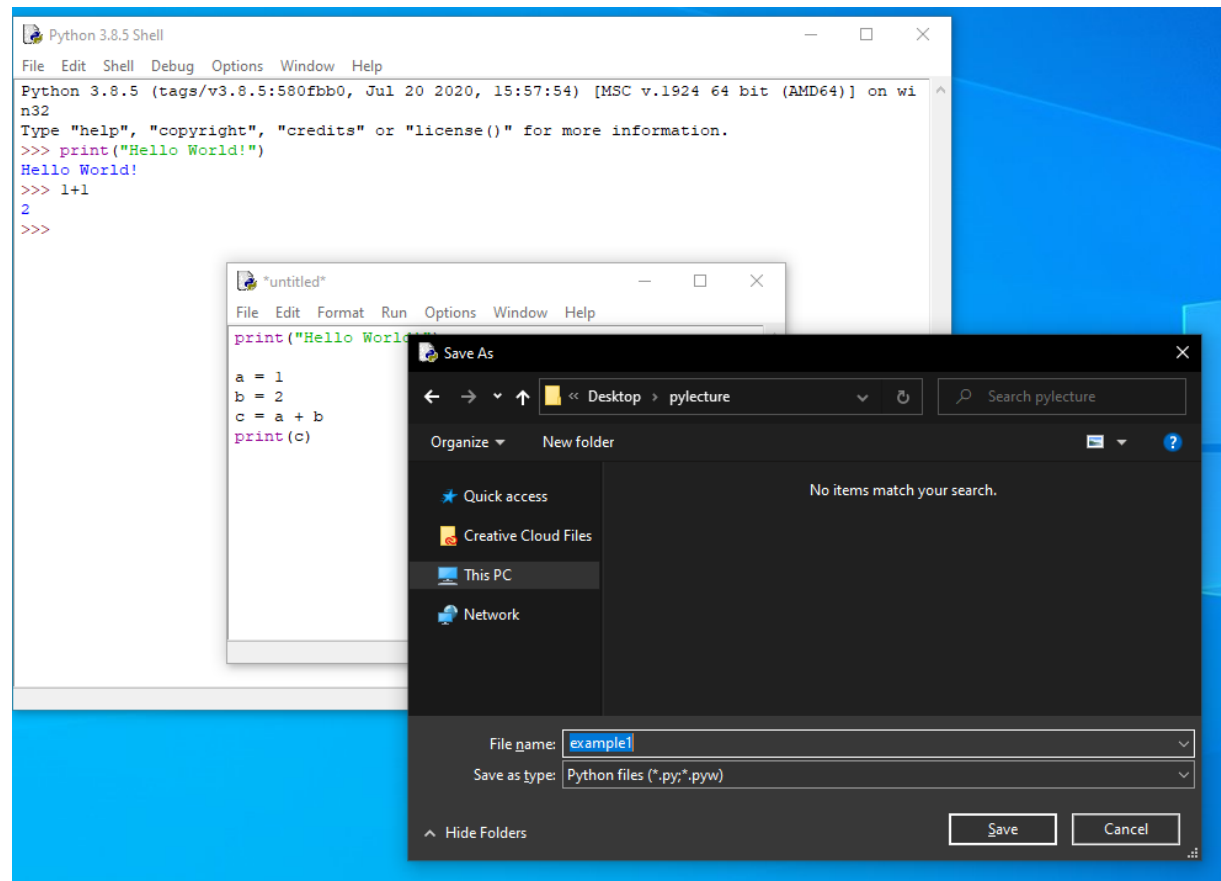
Python – Saving a Python file

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



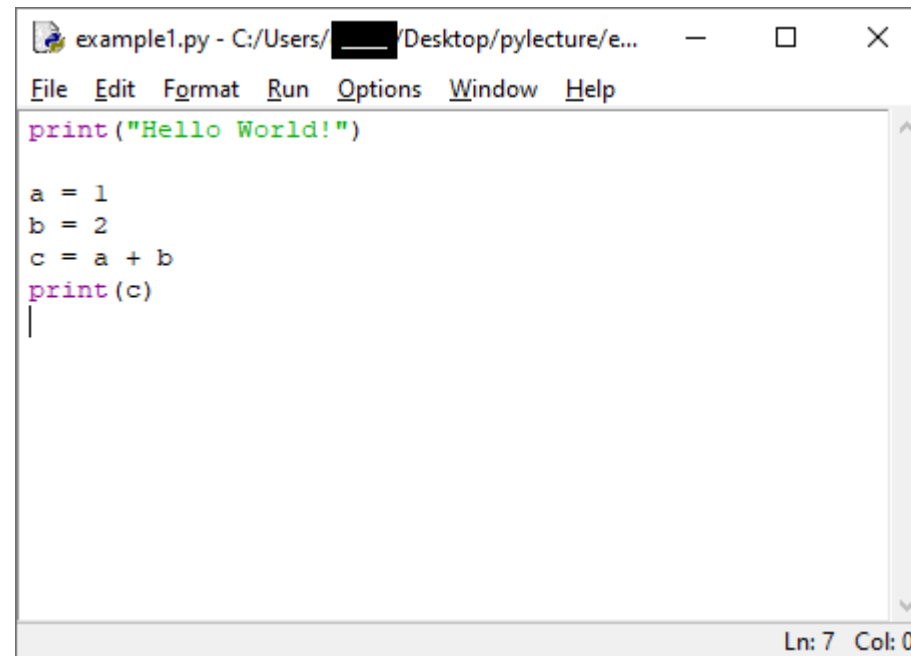
Python – Saving a Python file

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



Python – A Python file

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



The screenshot shows a window titled "example1.py - C:/Users/[redacted]/Desktop/pylecture/e...". The window contains a menu bar with "File", "Edit", "Format", "Run", "Options", "Window", and "Help". The code editor displays the following Python code:

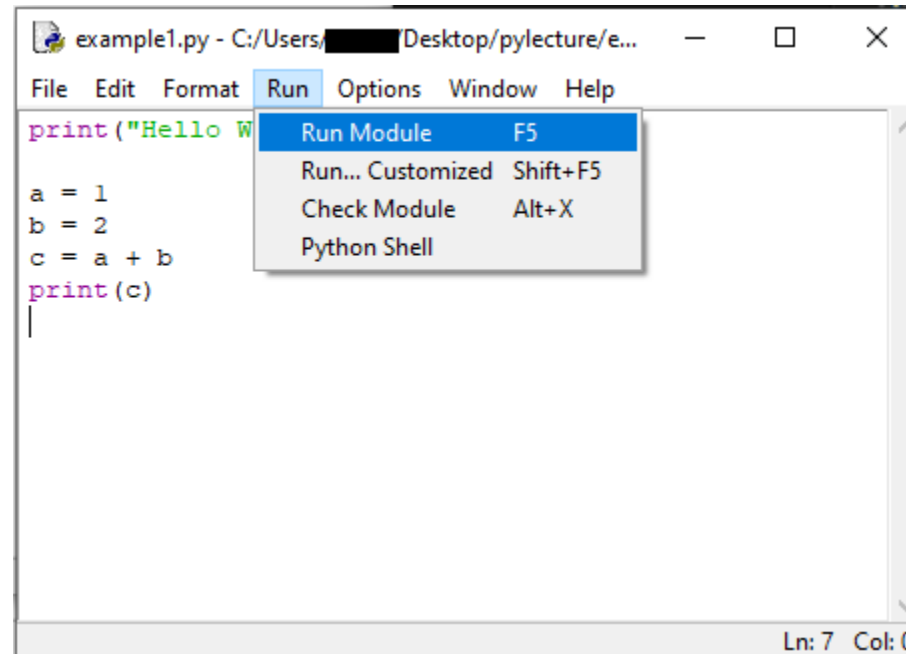
```
print("Hello World!")

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

The status bar at the bottom right indicates "Ln: 7 Col: 0".

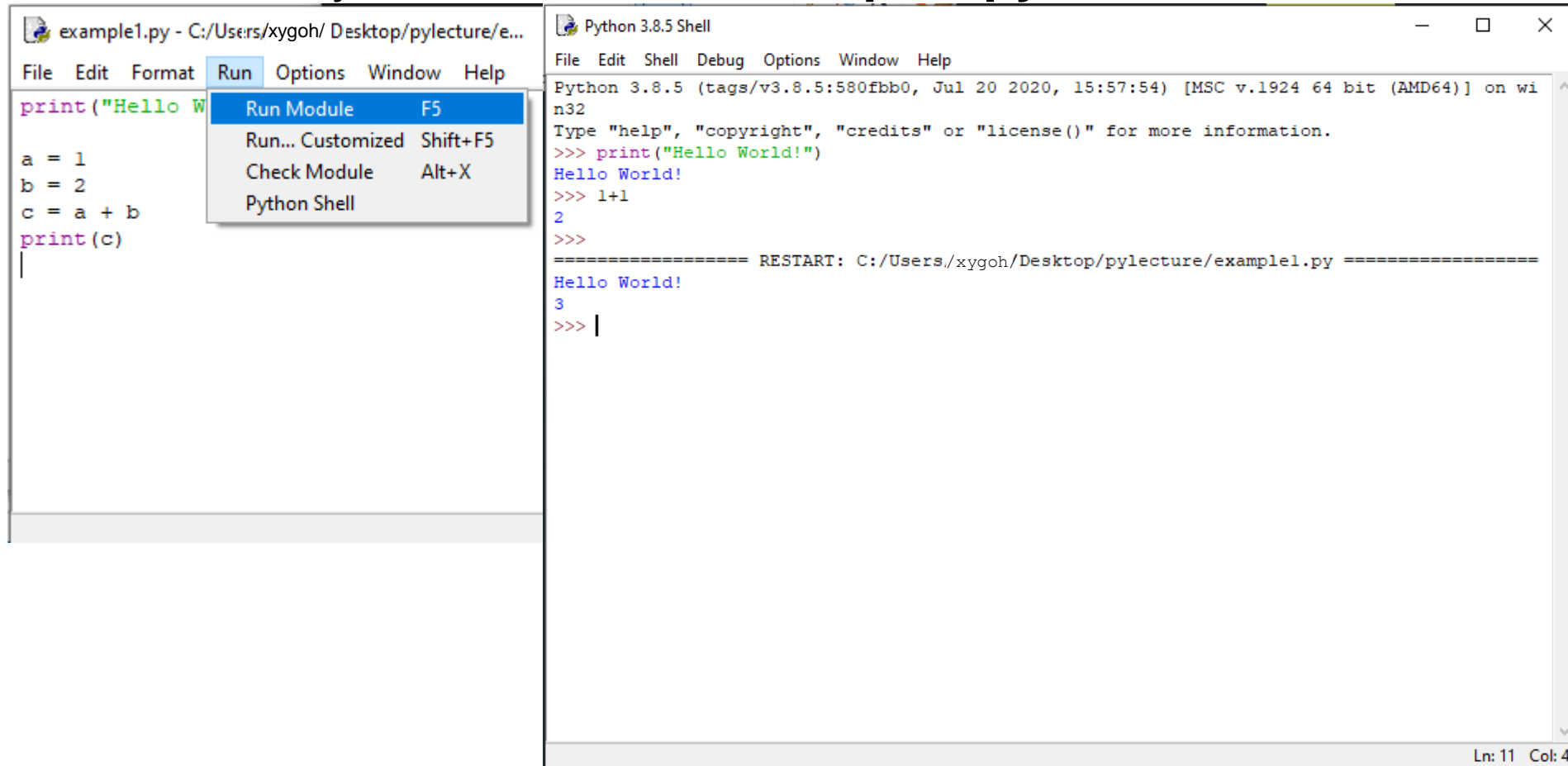
Python – Running a Python file

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



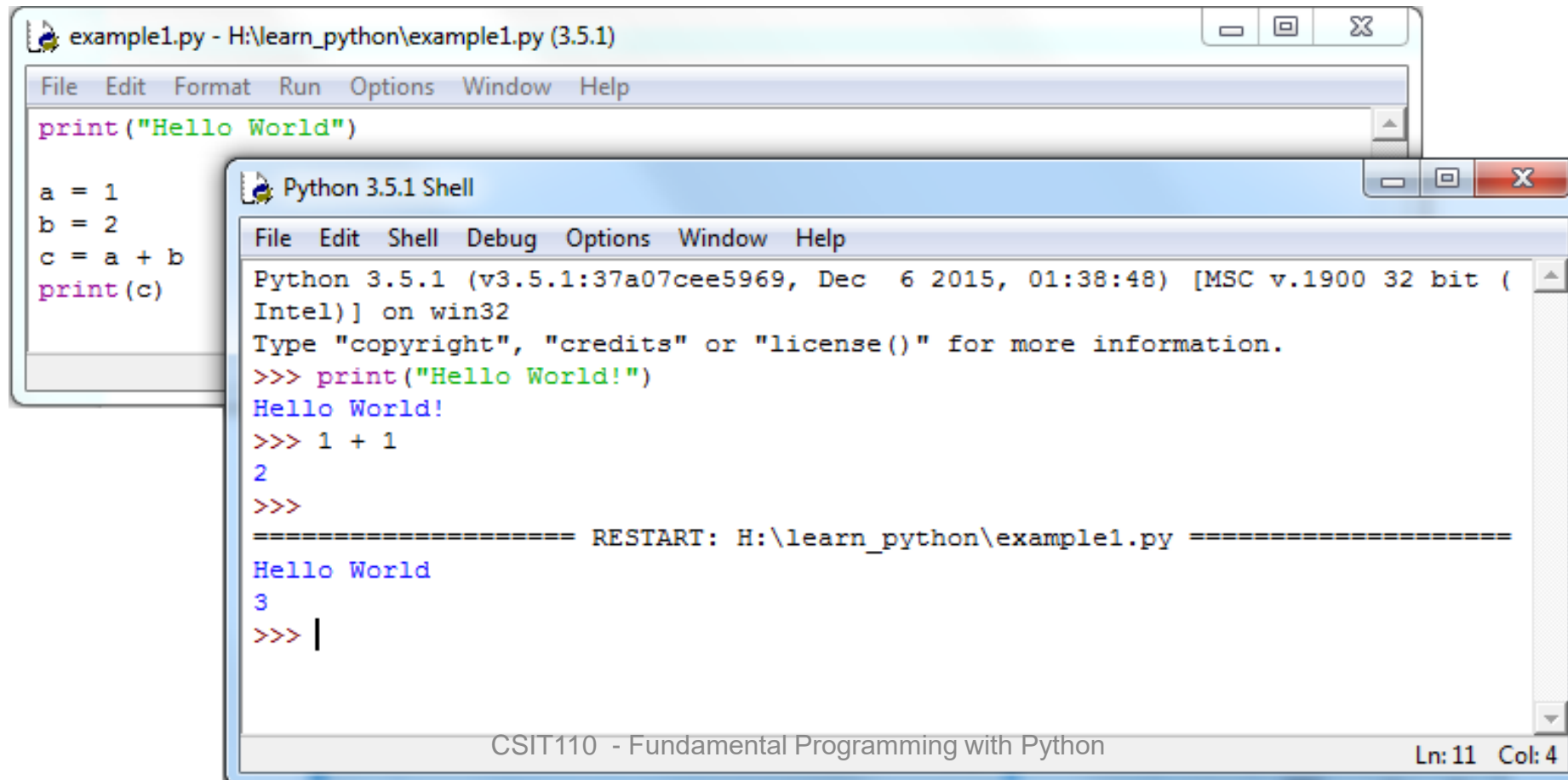
Python – Running a Python file

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



Python – Sequential programming

The instructions are executed after the previous one has completed



The image shows a screenshot of a Python IDE. The top window, titled 'example1.py - H:\learn_python\example1.py (3.5.1)', contains the following code:

```
print("Hello World")

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

The bottom window, titled 'Python 3.5.1 Shell', shows the execution of the script. It displays the Python version and system information, followed by the output of the script:

```
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
>>> |
```

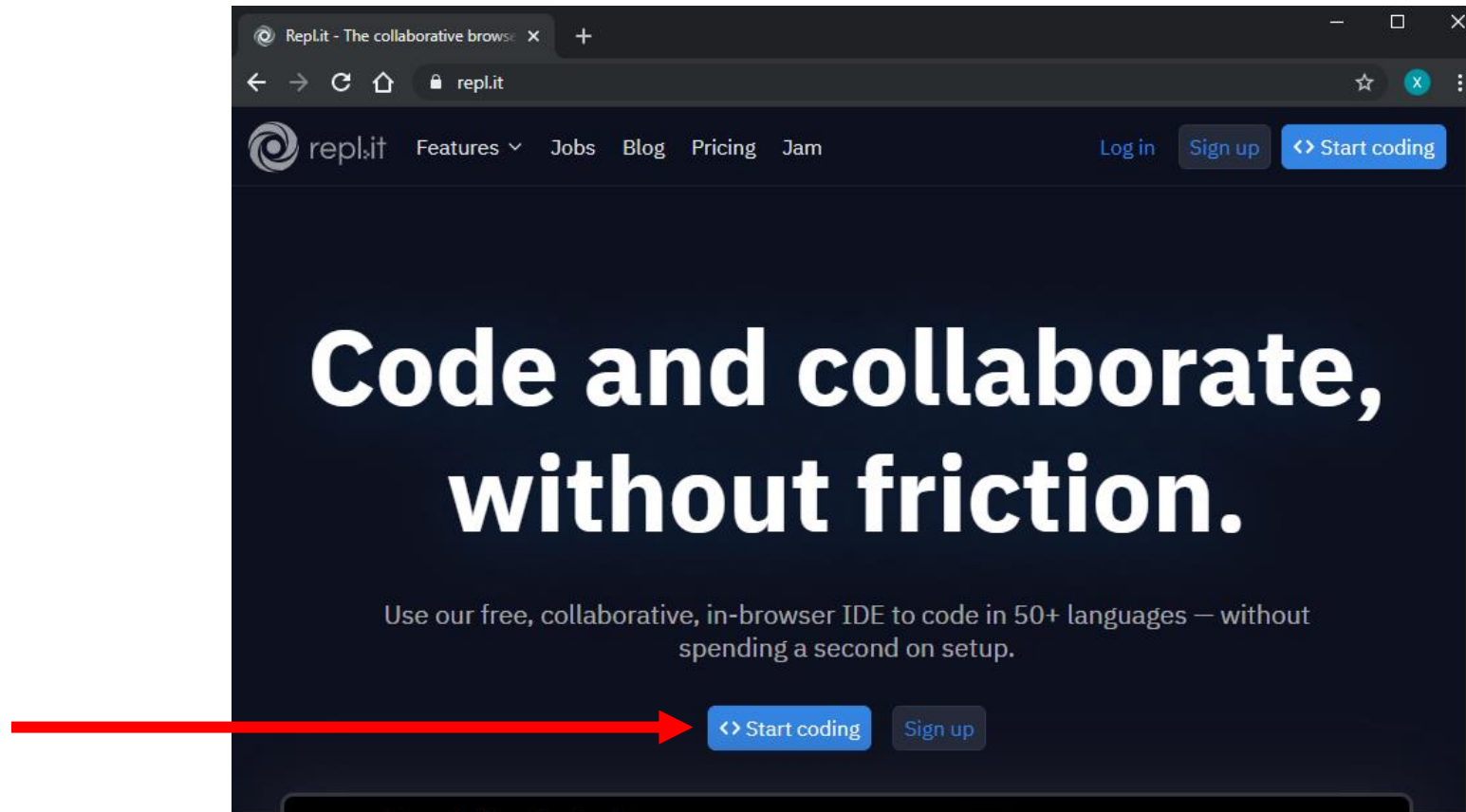
The status bar at the bottom of the shell window indicates 'CSIT110 - Fundamental Programming with Python' and 'Ln: 11 Col: 4'.

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

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

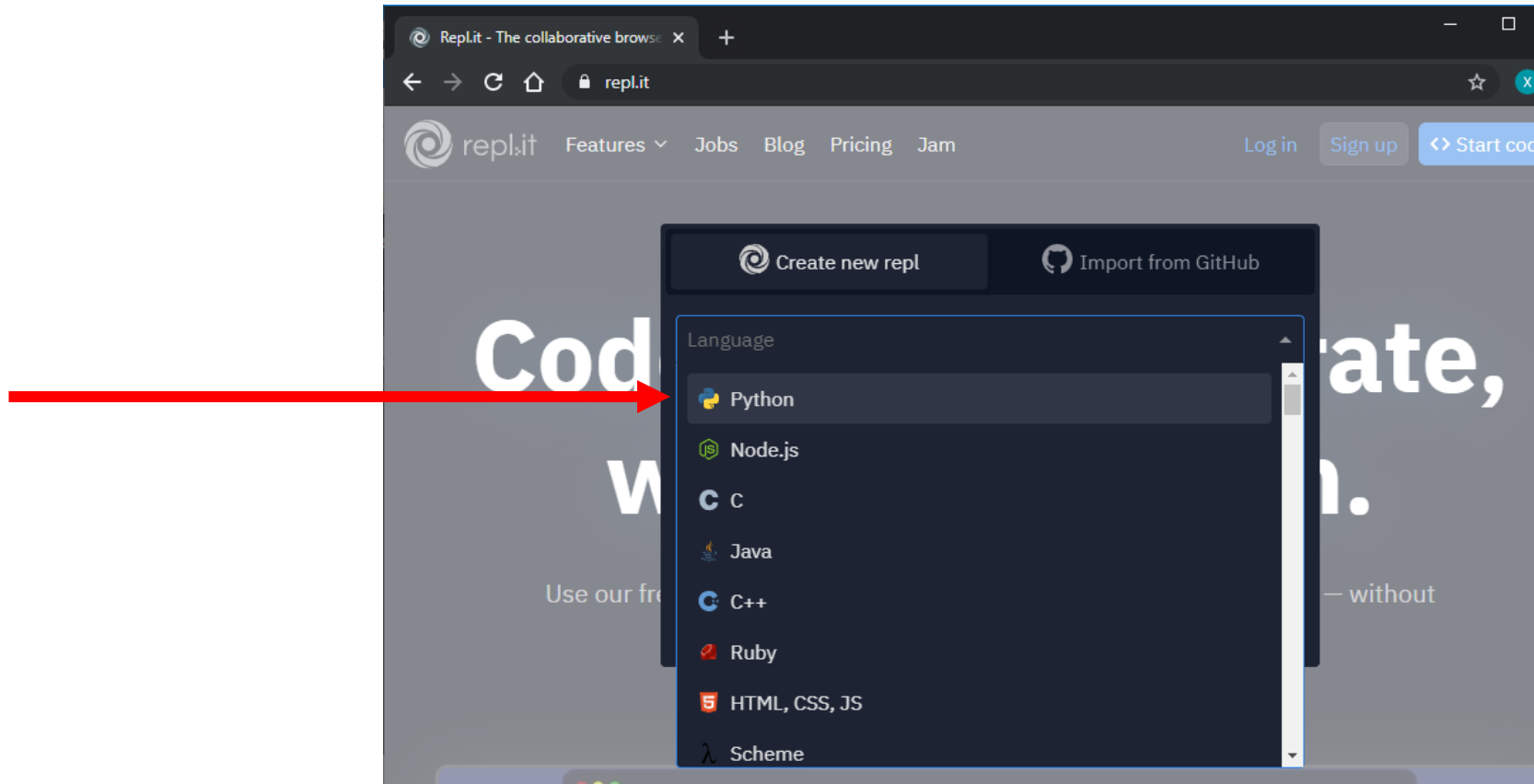
Online IDE - <http://repl.it>

Enter site -> '<>' start coding



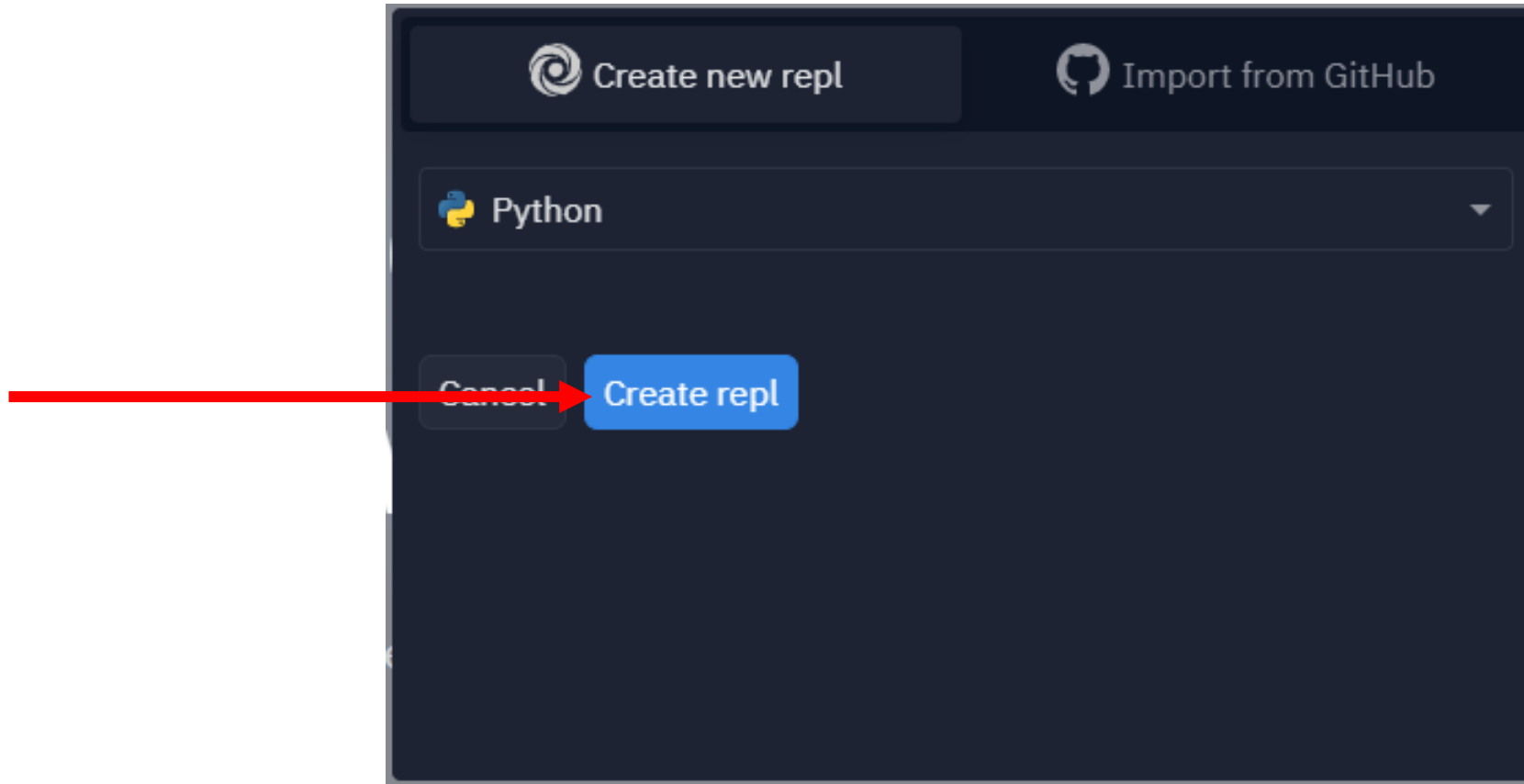
Online IDE - <http://repl.it>

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

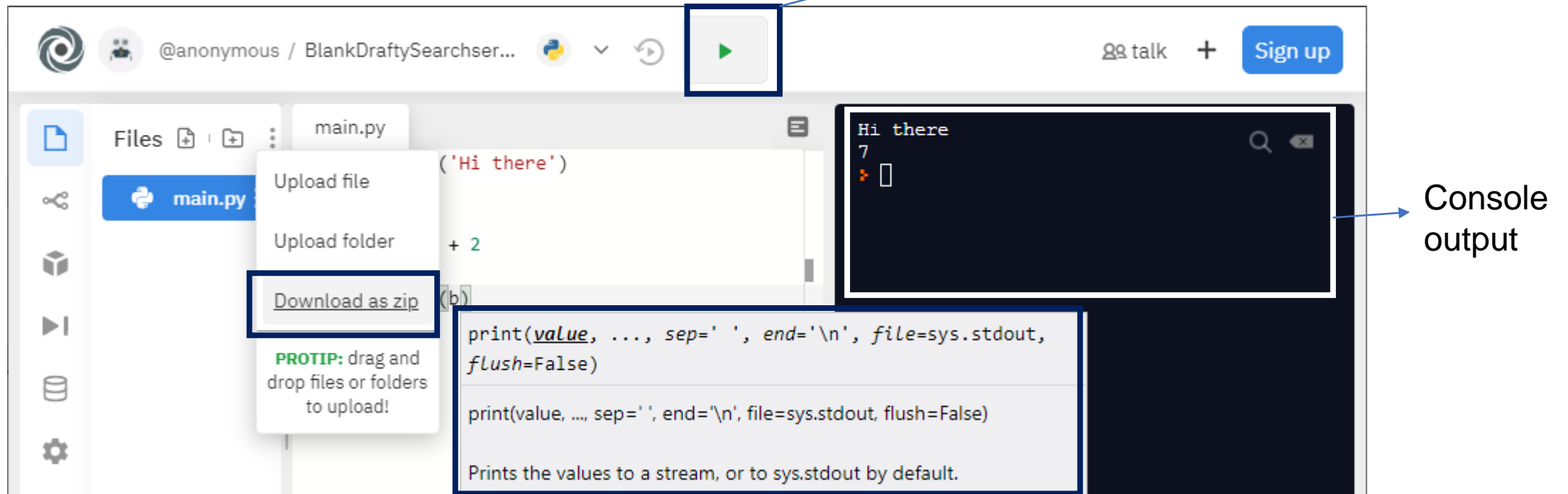


Online IDE - <http://repl.it>

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



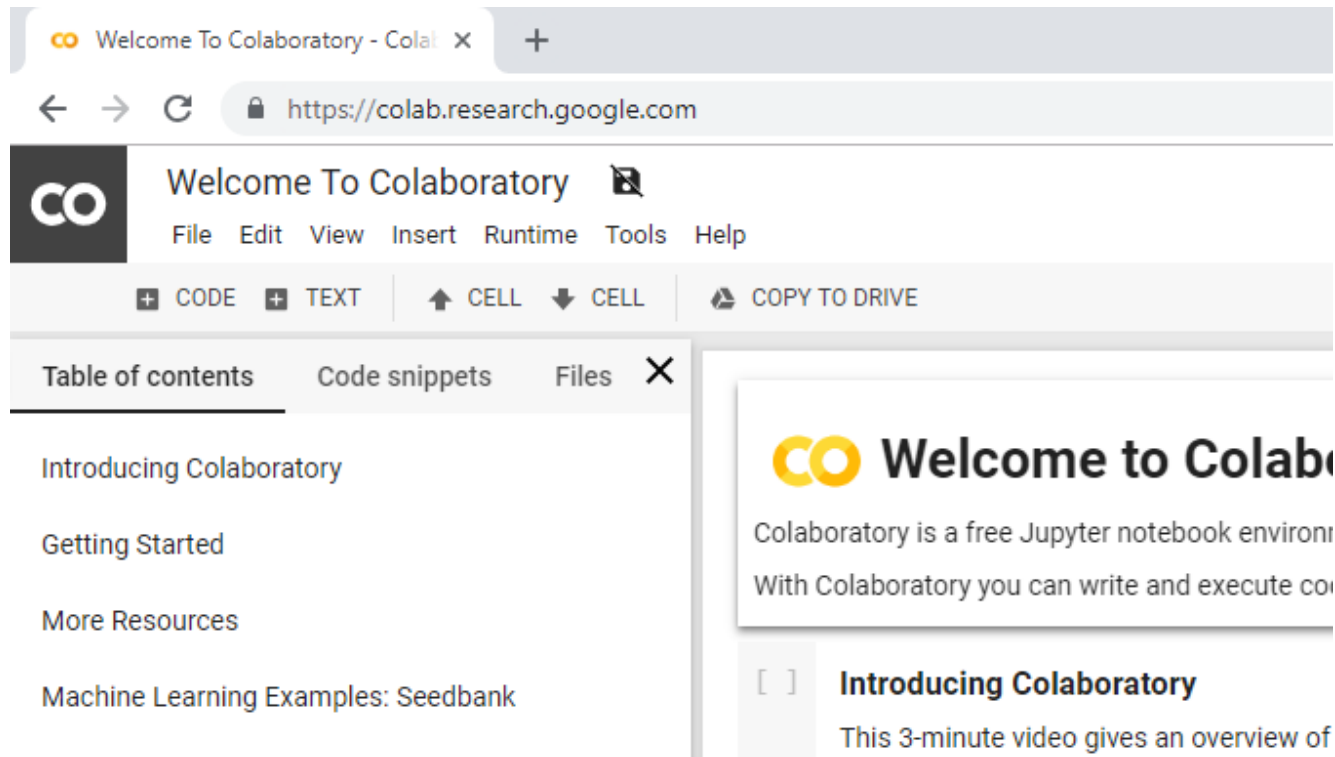
Online IDE - <http://repl.it>



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

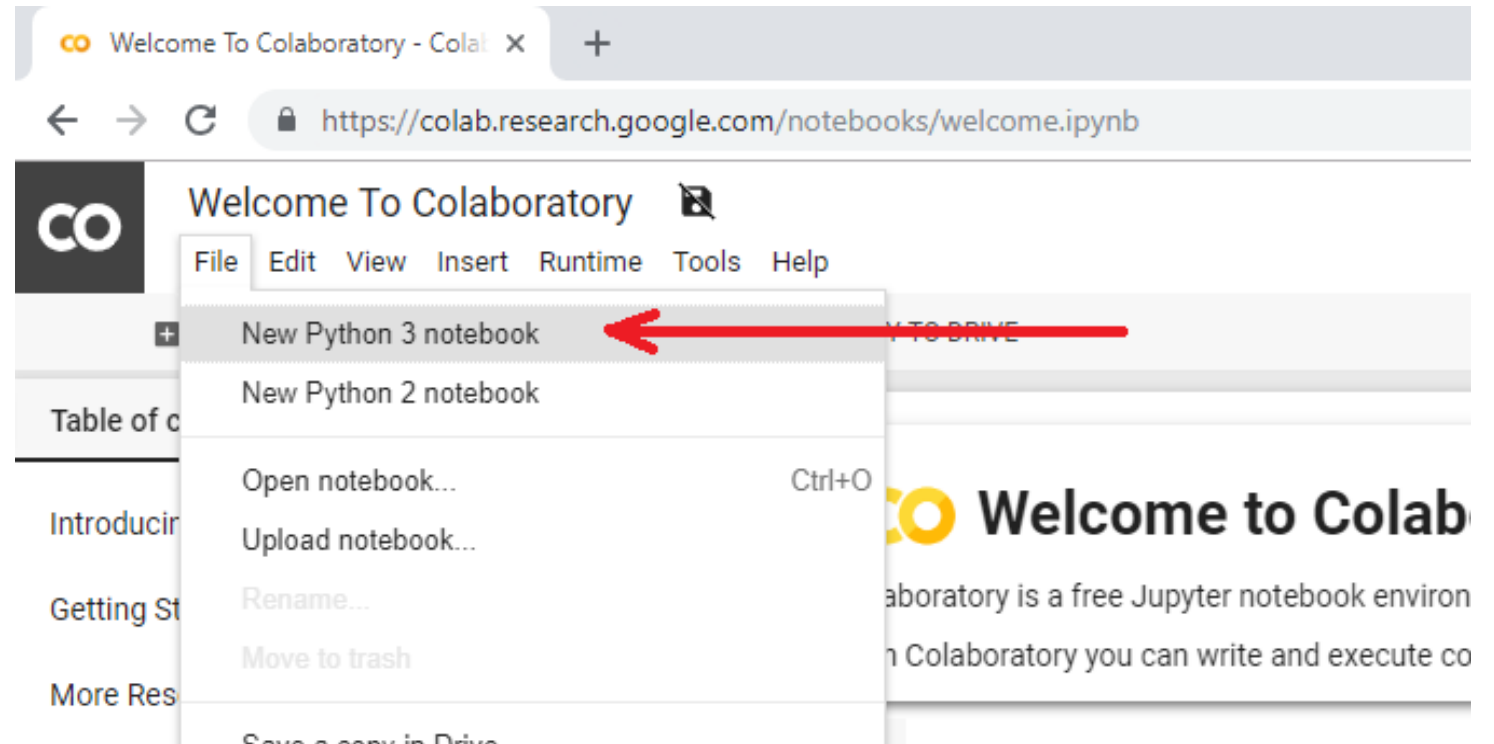
Online IDE – Google Colab

- <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

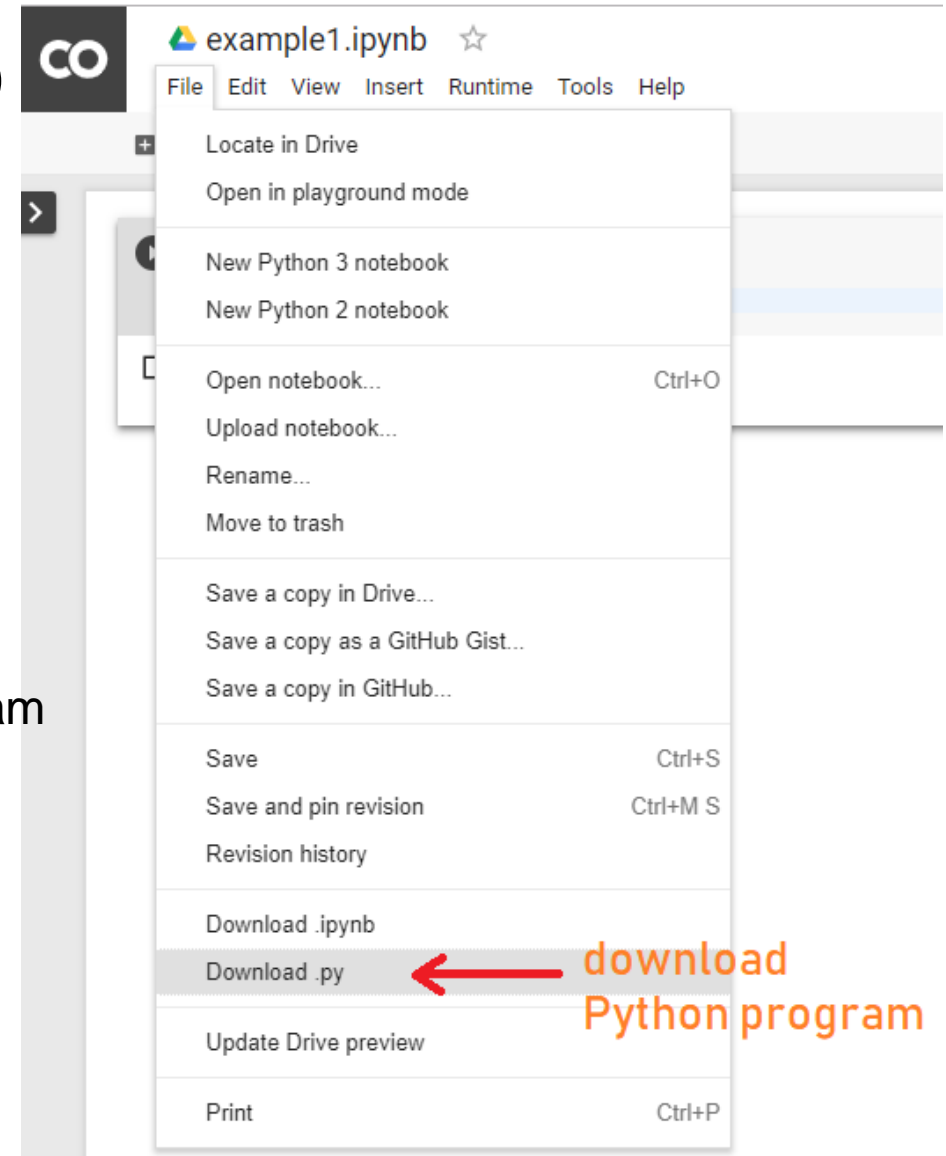
- <https://colab.research.google.com>
- All work can be saved on Google Drive
- Uses Jupyter Notebook style IDE



Online IDE – Google Colab

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

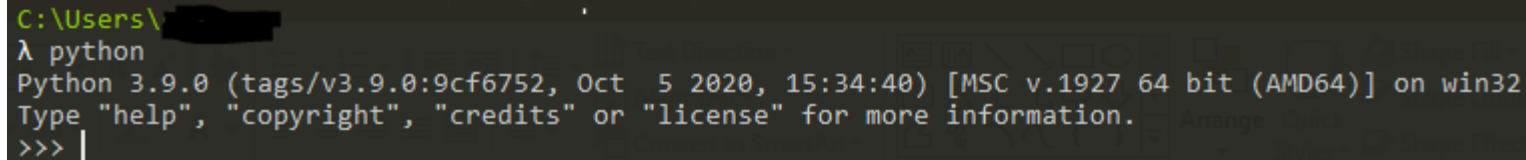
Download Python program



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



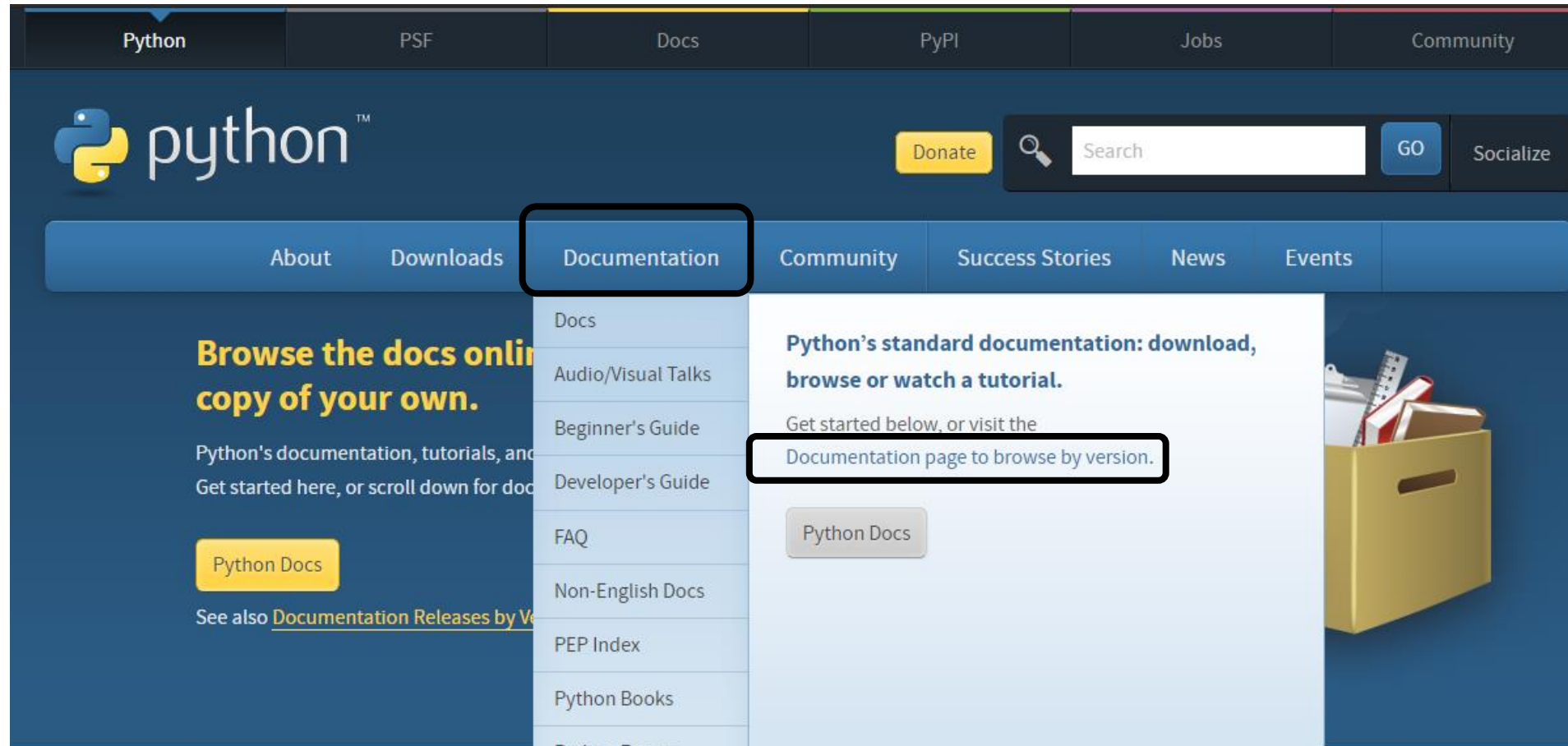
```
C:\Users\<username>\> python
Python 3.9.0 (tags/v3.9.0:9cf6752, Oct 5 2020, 15:34:40) [MSC v.1927 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more
>>> |
```

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>

Documentation



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 function, 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 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