MSAS Tutorial Sequence -Module Two-

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THANKS FOR COMING BACK

Goals of Today

1. Understand Some Basics Of Python
2. Learn to navigate Jupyter Notebook

Python

Background and Info

- Python is a popular programming language that was released in 1991
- Designed for readability and simplicity
- Has wide variety of uses and packages
- We will be using Python for our data manipulation
- Python vs. C++
  - Similar syntaxes
  - No typecasting in Python
  - No semicolons in Python
  - Uses white space to define scope (not brackets)

Variables in Python

- Variables are containers for storing data values.
- Unlike other programming languages, Python has no command for declaring a variable.
  - You don’t have to typecast your variables at declaration
  - A variable is created the moment you first assign a value to it.
- Initialize a variable using the following format: name = value
- Examples:
  - x = 5 (x is now an integer)
  - y = “Garrett” (y is now a string)
  - x = “Michigan” (x is now a string – the types can change after declaration)
  - average_points = 23.4 (average_points is now a “float”/decimal)

Notes about variables in Python

- Integers and Decimals can be positive or negative.
- Strings can be surrounded by single or double quotes (but not a mixture)
- Any variable can be outputted using the print command
  - x = 5
  - print(x) → This will output 5
- You can use other variables to create new variables
  - x = 5
  - y = 10
  - z = x + y
  - print(z) → This will output 15

Variable types

- You can get the data type of any object by using the type() function
- Useful when we get into more advanced variable types
- Example
  - x = 5
  - print(type(x)) → <class ‘int’>
- The type of a variable can be changed really simply through casting
  - x = 5
  - y = str(x)
  - print(type(y)) → <class ‘str’>
  - Be careful, as casting in the opposite direction will cause an error unless the string only contains numeric characters

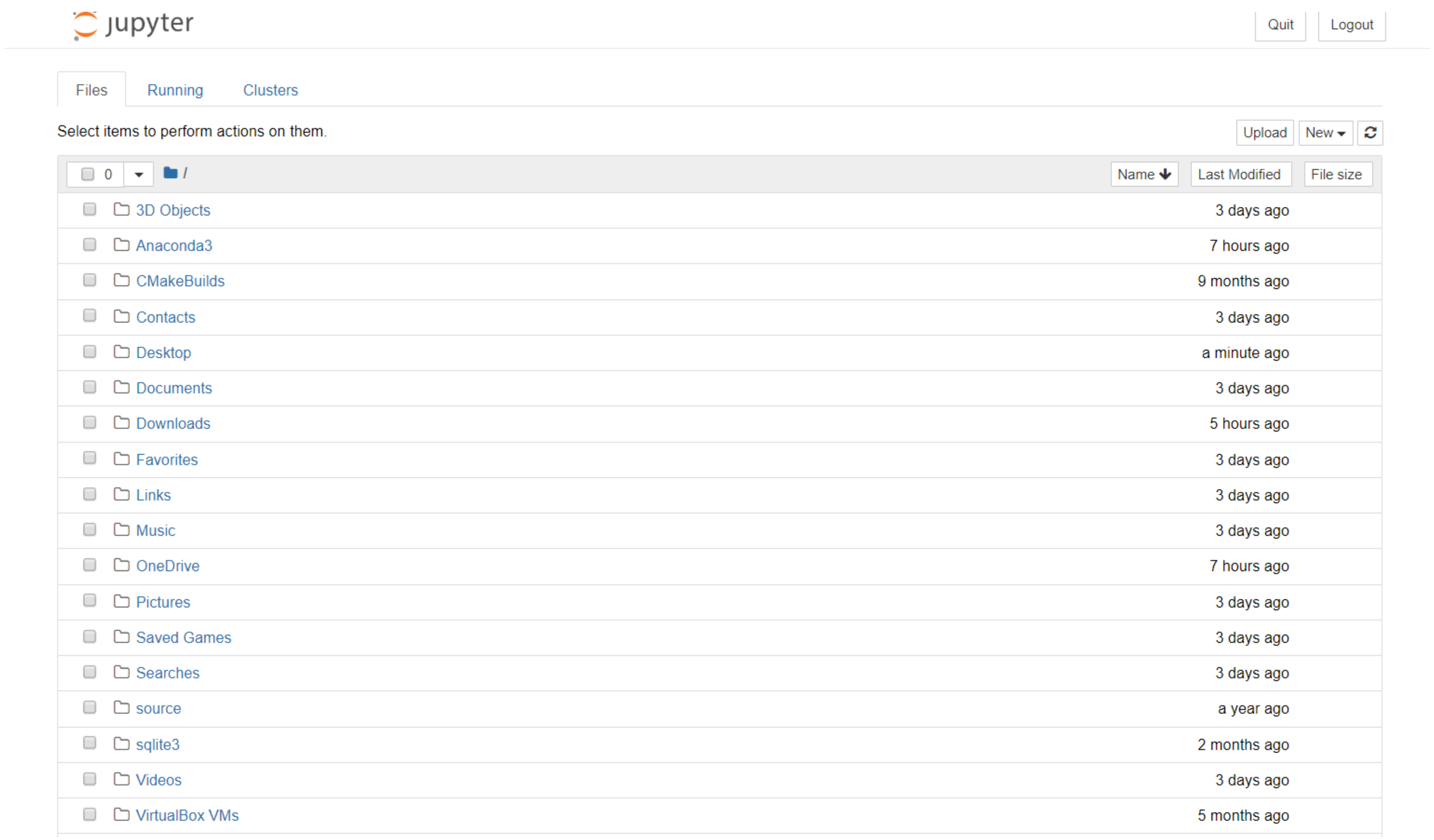
Literals vs Variables

- A literal is the literal value of something
- Literals are useful when we don't want to store a piece of data in a variable
- Examples
  - x = 3
  - y = x + 5
  - print(y) → 8
  - print (3 + 5) → 8
  - print("hello world") → hello world

Operators

- Basic shared operator for integers and floats
  - Addition (+)
  - Subtraction (-)
  - Multiplication (*)
  - Exponents (**)
- Basic operators for strings
  - Addition (+)
  - x = “Python is ”
  - y = “cool”
  - print (x + y) → “Python is cool”
- CANNOT USE “+” OPERATOR ON OPERANDS WITH DIFFERENT TYPES
  - print(“Garrett” + 5) → Error
  - print(“Garrett” + str(5)) → Garrrett5

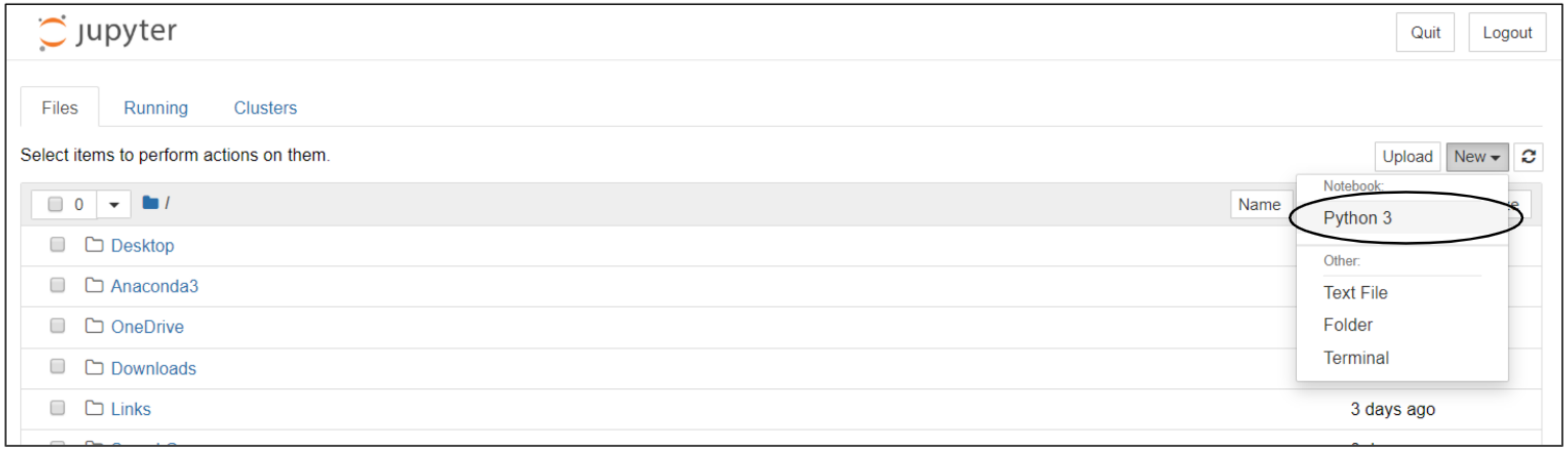
Jupyter Notebooks



Select items to perform actions on them.

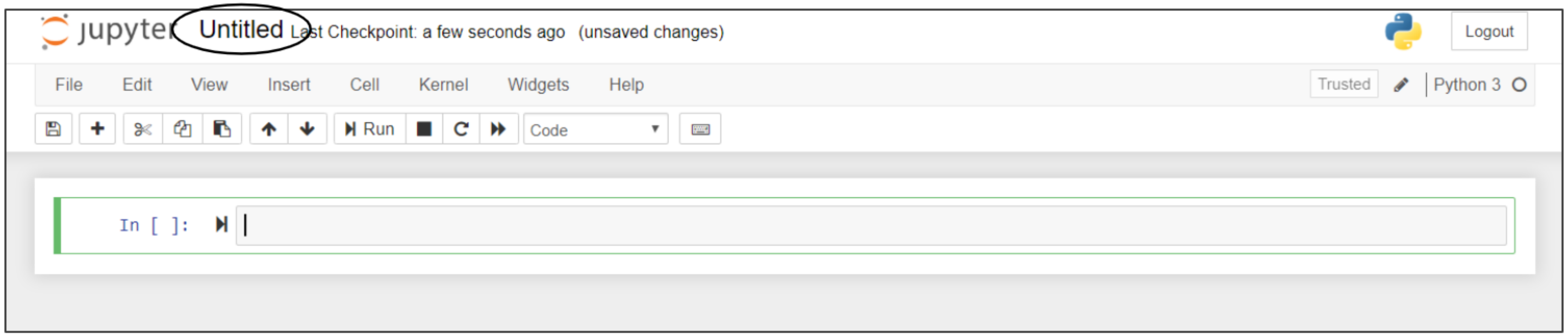
3D Objects	3 days ago
Anaconda3	7 hours ago
CMakeBuilds	9 months ago
Contacts	3 days ago
Desktop	a minute ago
Documents	3 days ago
Downloads	5 hours ago
Favorites	3 days ago
Links	3 days ago
Music	3 days ago
OneDrive	7 hours ago
Pictures	3 days ago
Saved Games	3 days ago
Searches	3 days ago
source	a year ago
sqlite3	2 months ago
Videos	3 days ago
VirtualBox VMs	5 months ago

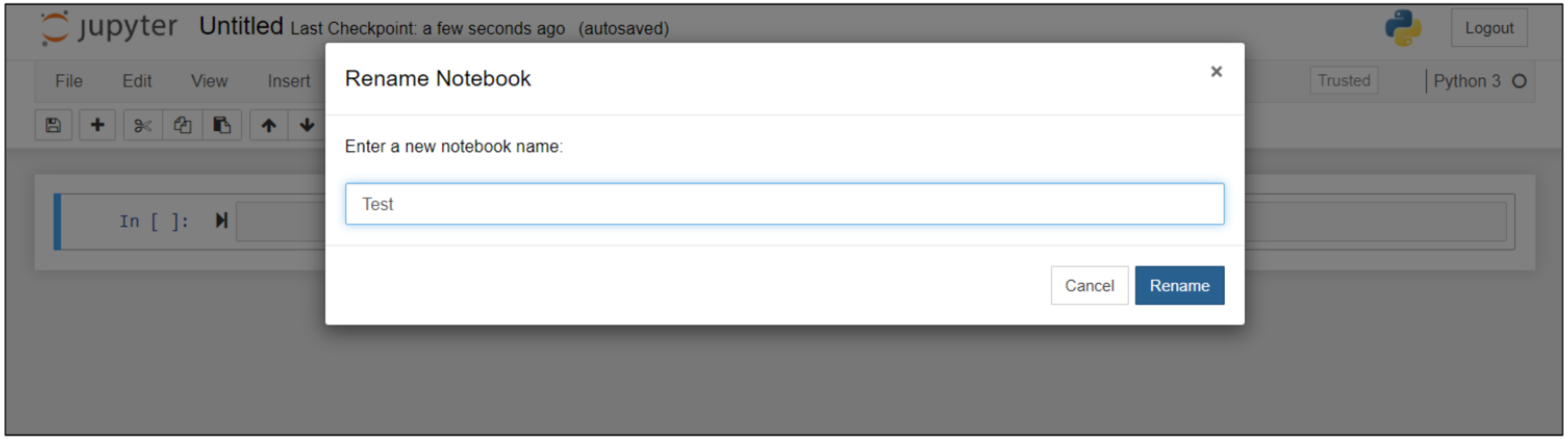
Dashboard



Select items to perform actions on them.

Desktop	
Anaconda3	
OneDrive	
Downloads	
Links	3 days ago





Rename Notebook

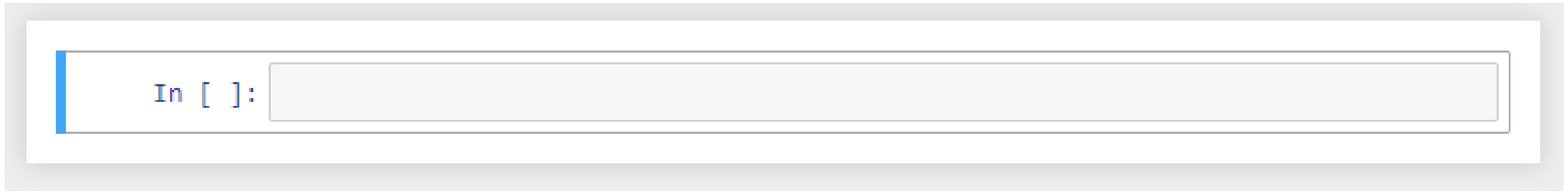
Enter a new notebook name:

Test

Cancel Rename

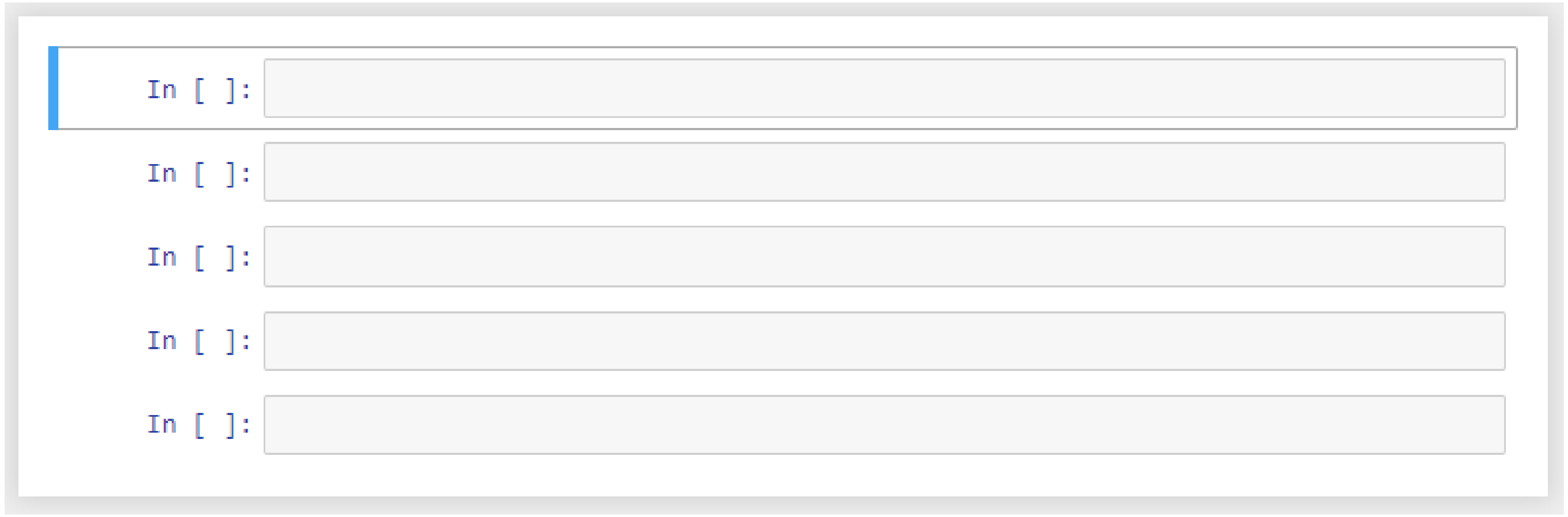
Understanding The Kernel

- Each cell contains code in it
- The kernel is a collection of cells
    - The cells in the kernel are connected to each other
    - When the entire kernel is run, cells run top to bottom
- Cells can “talk” to each other
    - A cell can use variables that were defined in another cell
    - Variable MUST be defined before being used
- Cells can be run individually, or as a whole


```
In [ ]:
```

Cell

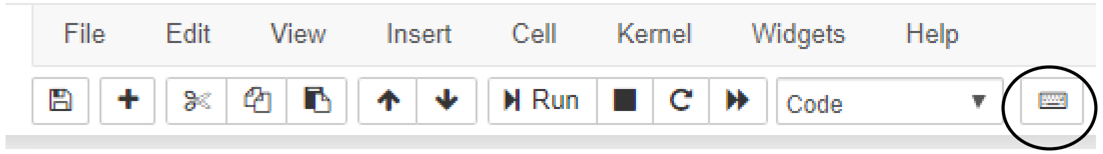
Blue cell → Command mode (controlling the kernel)
Green cell → Active mode (writing code)


```
In [ ]:
In [ ]:
In [ ]:
In [ ]:
In [ ]:
```

Kernel

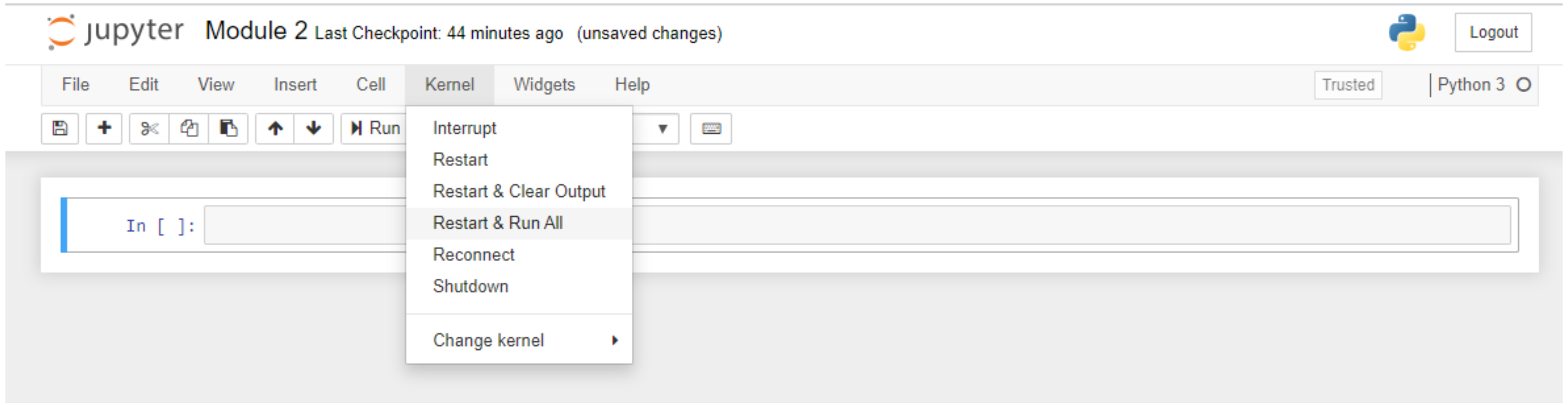
Basic Commands (Windows Controls)

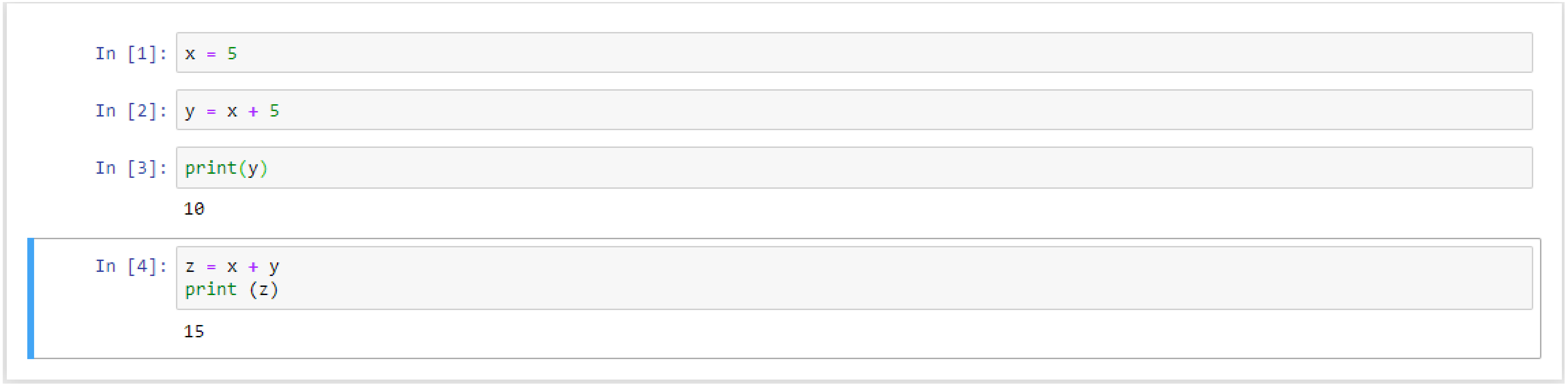
- Running a cell (Active and Command)
  - CTRL + ENTER
- Inserting a cell Below (Command)
  - b key
- Inserting a cell Above (Command)
  - a key
- Deleting your current cell (Command)
  - d, d (d key twice)
- Save the kernel
  - CTRL + s



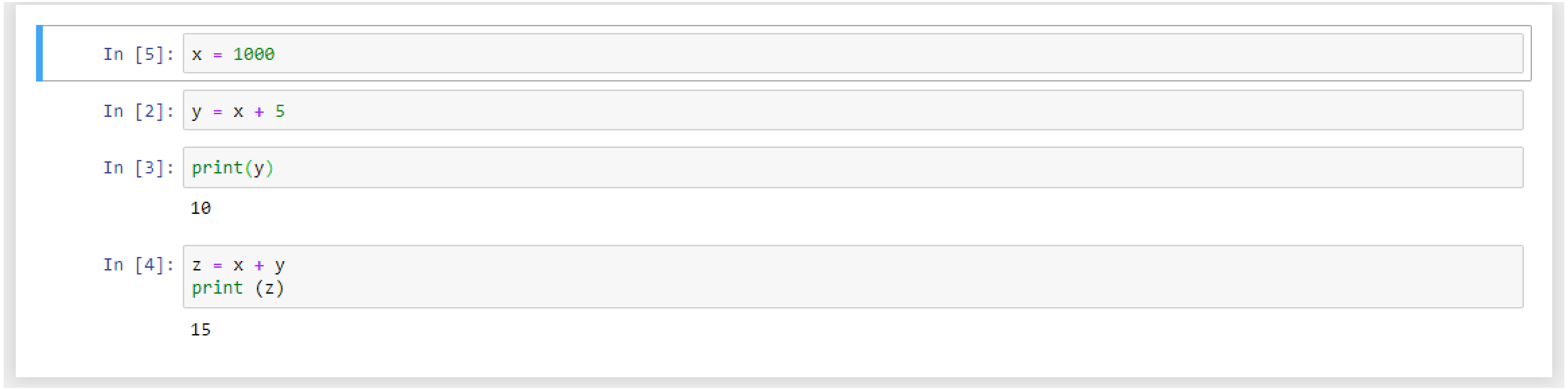
Ordering of the cells

- Pay close attention to the order in which cells are run
- Every time you edit a cell, you should run it
- If you edit a cell and do not run it, the other cells will think that nothing has changed
- It is often useful to just restart the kernel and re-run everything (will restart cell numbers at 1)
  - “Restart and clear output” will delete all old variables (otherwise, old variables will never die)





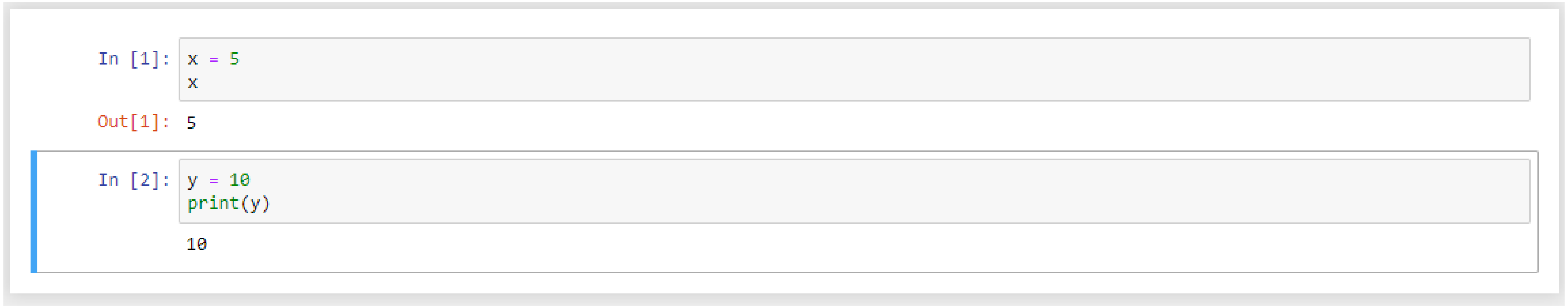
```
In [1]: x = 5

In [2]: y = x + 5

In [3]: print(y)

10

In [4]: z = x + y
        print (z)

15
```



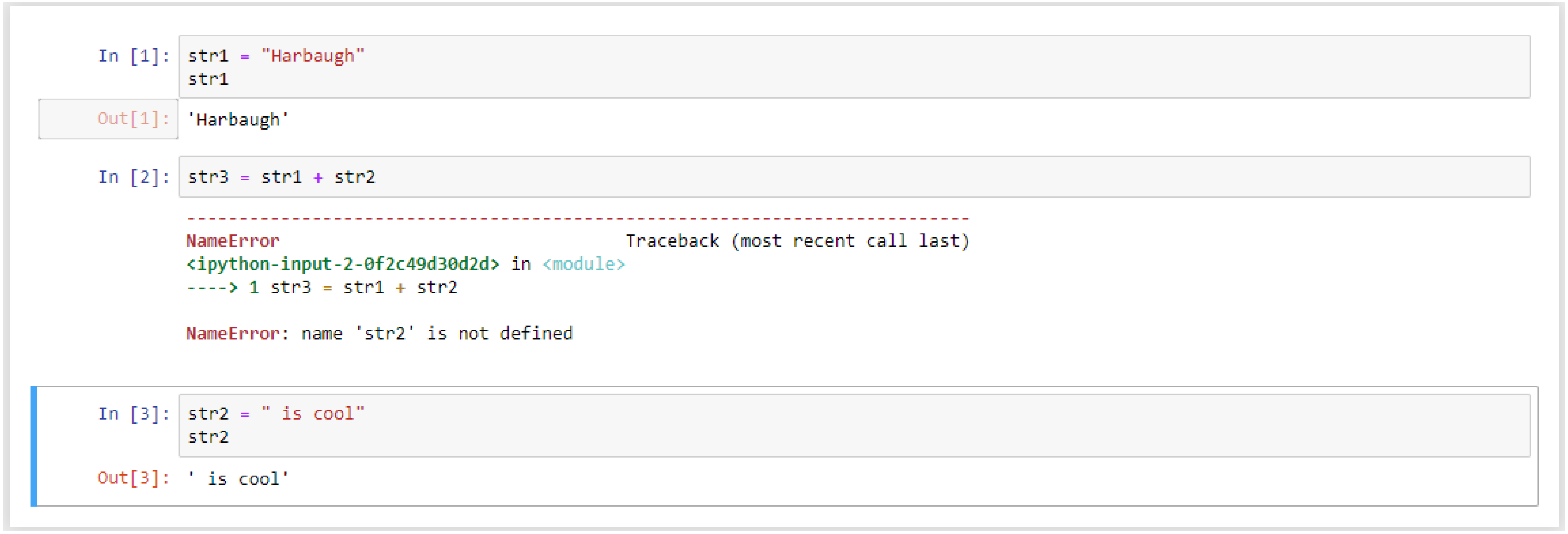
```
In [5]: x = 1000

In [2]: y = x + 5

In [3]: print(y)

        10

In [4]: z = x + y
        print (z)

        15
```

Additional Information

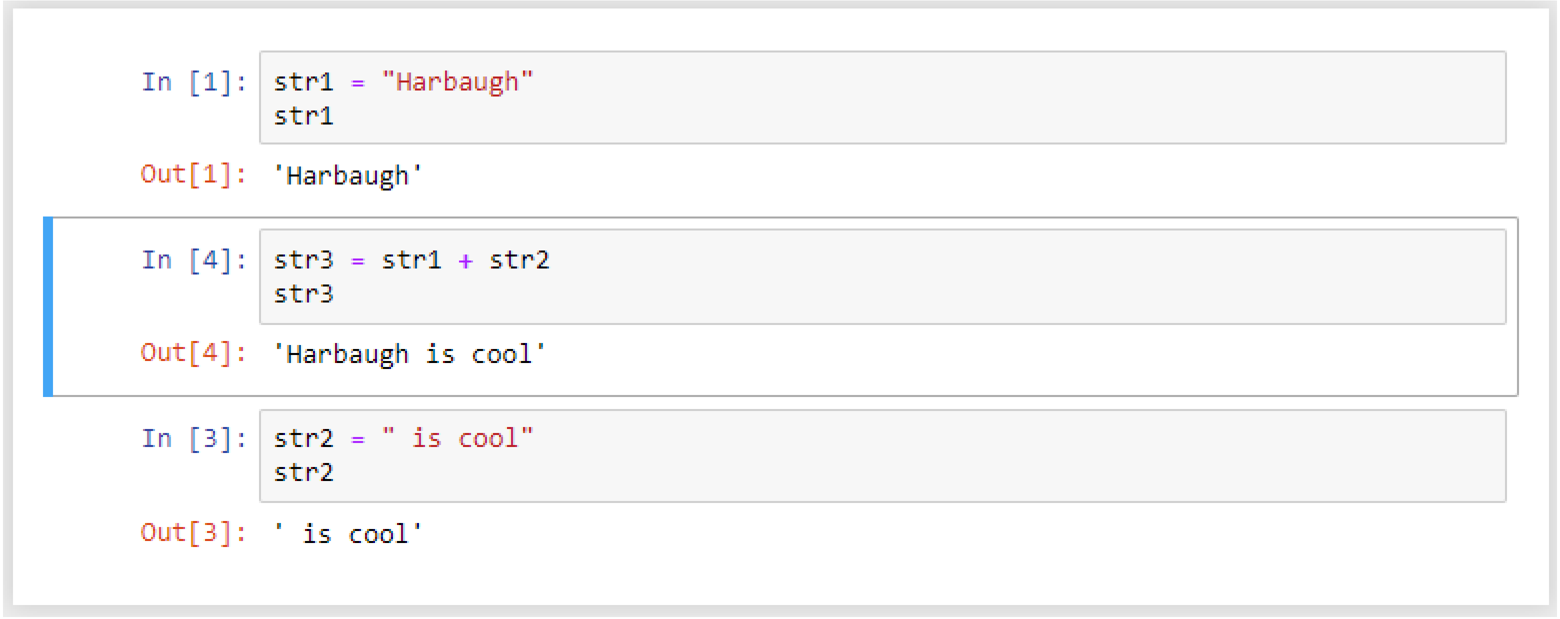
- “Out [ ]” is the output for cell that was run
- Print statements do not generate “Out [ ]” blocks, but the behavior is still the same
- In jupyter notebooks, you don’t have to use print statements to get the output of a variable



```
In [1]:  x = 5
         x

Out[1]:  5

In [2]:  y = 10
         print(y)

         10
```



```
In [1]: str1 = "Harbaugh"
        str1

Out[1]: 'Harbaugh'

In [2]: str3 = str1 + str2

        ---------------------------------------------------------------------------
        NameError                                 Traceback (most recent call last)
        <ipython-input-2-0f2c49d30d2d> in <module>
        ----> 1 str3 = str1 + str2

        NameError: name 'str2' is not defined

In [3]: str2 = " is cool"
        str2

Out[3]: ' is cool'
```



```
In [1]: str1 = "Harbaugh"
        str1

Out[1]: 'Harbaugh'

In [4]: str3 = str1 + str2
        str3

Out[4]: 'Harbaugh is cool'

In [3]: str2 = " is cool"
        str2

Out[3]: ' is cool'
```

Take some time to play around with the environment

ASK QUESTIONS