Python for Physics Lab -1

By

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What is Python

Python is a widely used general-purpose high level programming language, designed by Guido van Rossum in 1991.

Why Python

Python has several advantages over other programming languages. They are:

i. Code readability
ii. Easy syntax
iii. English like keywords
iv. Concise programs
v. Automatic Memory languages
vi. Free and open source software

Python comparing with C

C

```
#include "stdio.h"
int main() {
  printf("Hello\n");
}
```

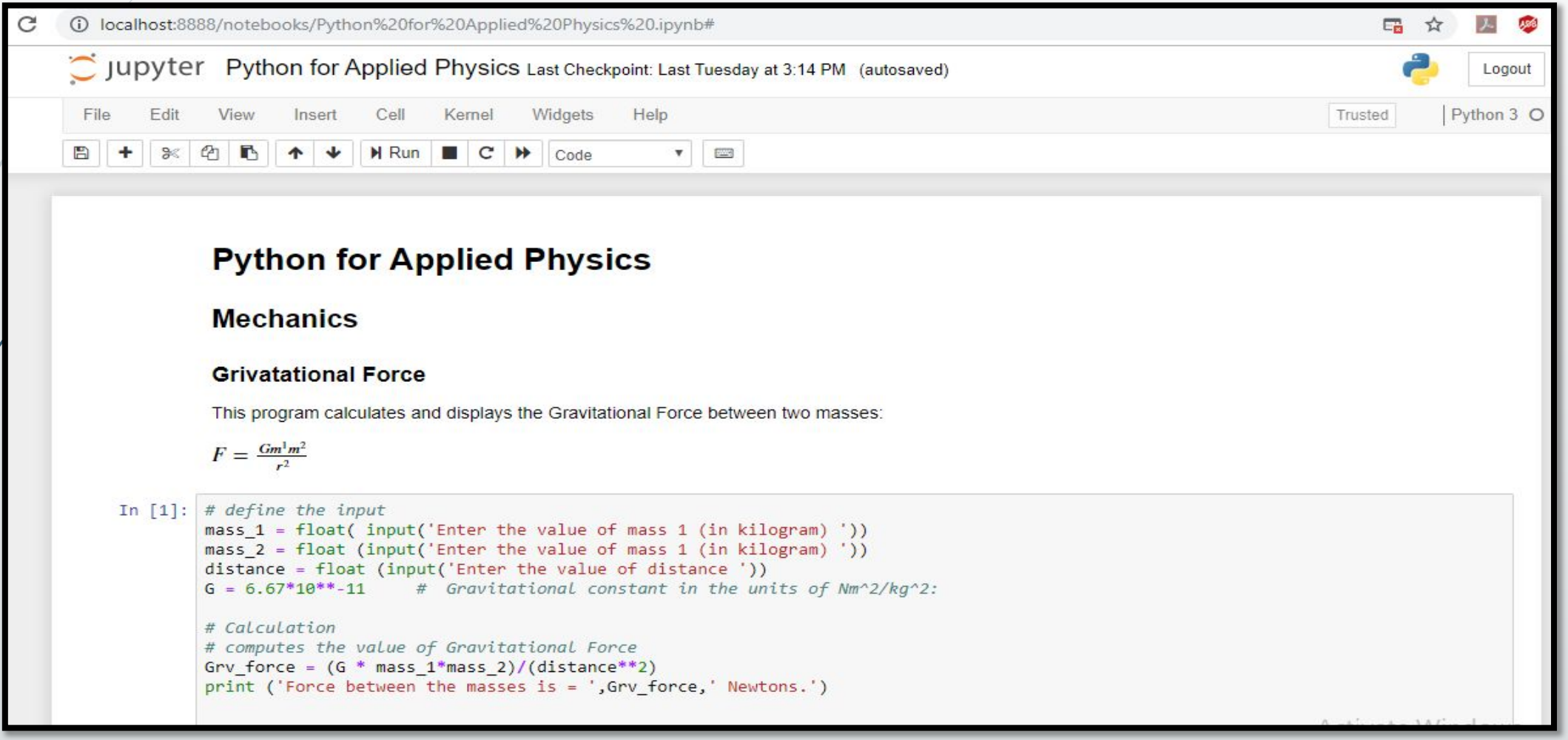
Java

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

python

```
print("hello")
```

Notice: no ;


localhost:8888/notebooks/Python%20for%20Applied%20Physics%20.ipynb#
jupyter Python for Applied Physics Last Checkpoint: Last Tuesday at 3:14 PM (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3
Run
Code
Python for Applied Physics
Mechanics
Grivatational Force
This program calculates and displays the Gravitational Force between two masses:
$F = \frac{Gm^1m^2}{r^2}$
In [1]:
# define the input
mass_1 = float(input('Enter the value of mass 1 (in kilogram) '))
mass_2 = float (input('Enter the value of mass 1 (in kilogram) '))
distance = float (input('Enter the value of distance '))
G = 6.67*10**-11 # Gravitational constant in the units of Nm^2/kg^2:
# Calculation
# computes the value of Gravitational Force
Grv_force = (G * mass_1*mass_2)/(distance**2)
print ('Force between the masses is = ',Grv_force,' Newtons.')

Introduction to Jupiter Notebook

The Jupyter Notebook is an open-source web application that allows us to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.

A single document that combines explanations with executable code and its output — an ideal way to provide:

- reproducible research results
- documentation of processes
- instructions
- tutorials and training materials of all shapes and sizes

Installation

The easiest way for a beginner to get started with Jupyter Notebooks is by installing Anaconda.

Link for installing Anaconda is:
https://www.anaconda.com/products/individual

Anaconda is the most widely used Python distribution for data science and comes pre-loaded with all the most popular libraries and tools.
Some of the biggest Python libraries included in Anaconda include NumPy, pandas, and Matplotlib, though the full 1000+ list is exhaustive.

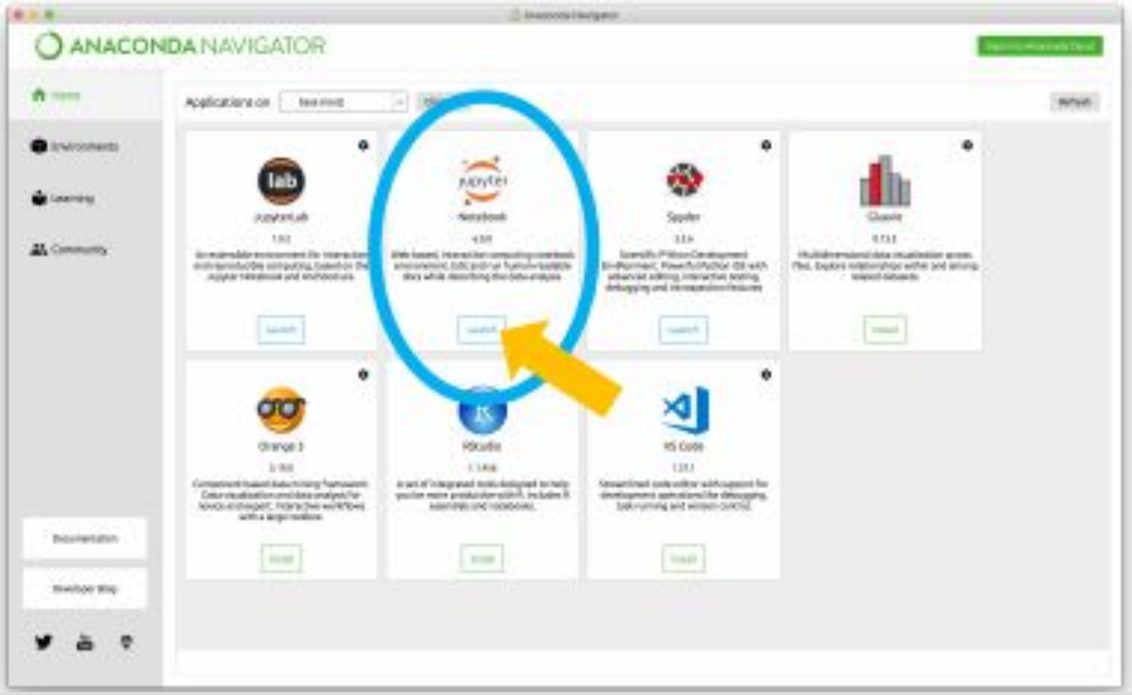
How to Launch Jupyter Notebook

There are 3 ways to launch Jupyter Notebook:

1) Using Anaconda Navigator

   a) Open the application called Anaconda Navigator (this may take a couple of minutes)

   b) Click on “Launch” in the Jupyter Notebook box



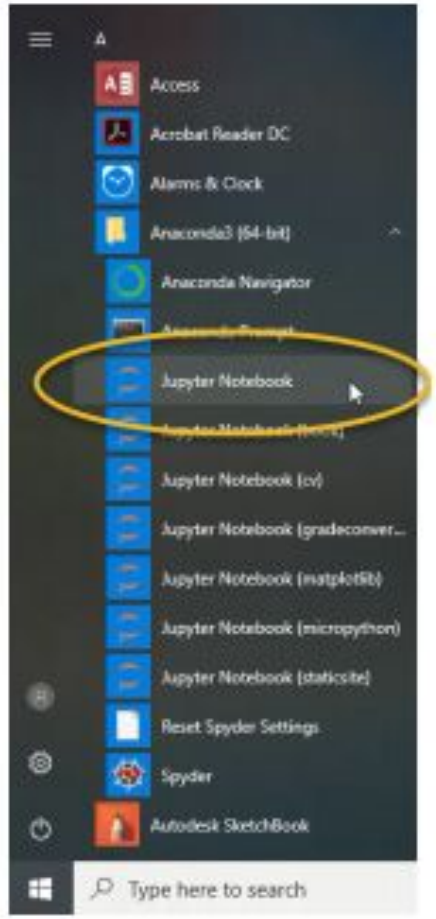
How to Launch Jupyter Notebook

2) Using Anaconda Prompt
   a) Open the application called Anaconda Prompt
   b) Type “jupyter notebook” (without quotes) and hit the return key

Note: your Anaconda Prompt window will show a different pathname than in this image, but it will look similar!

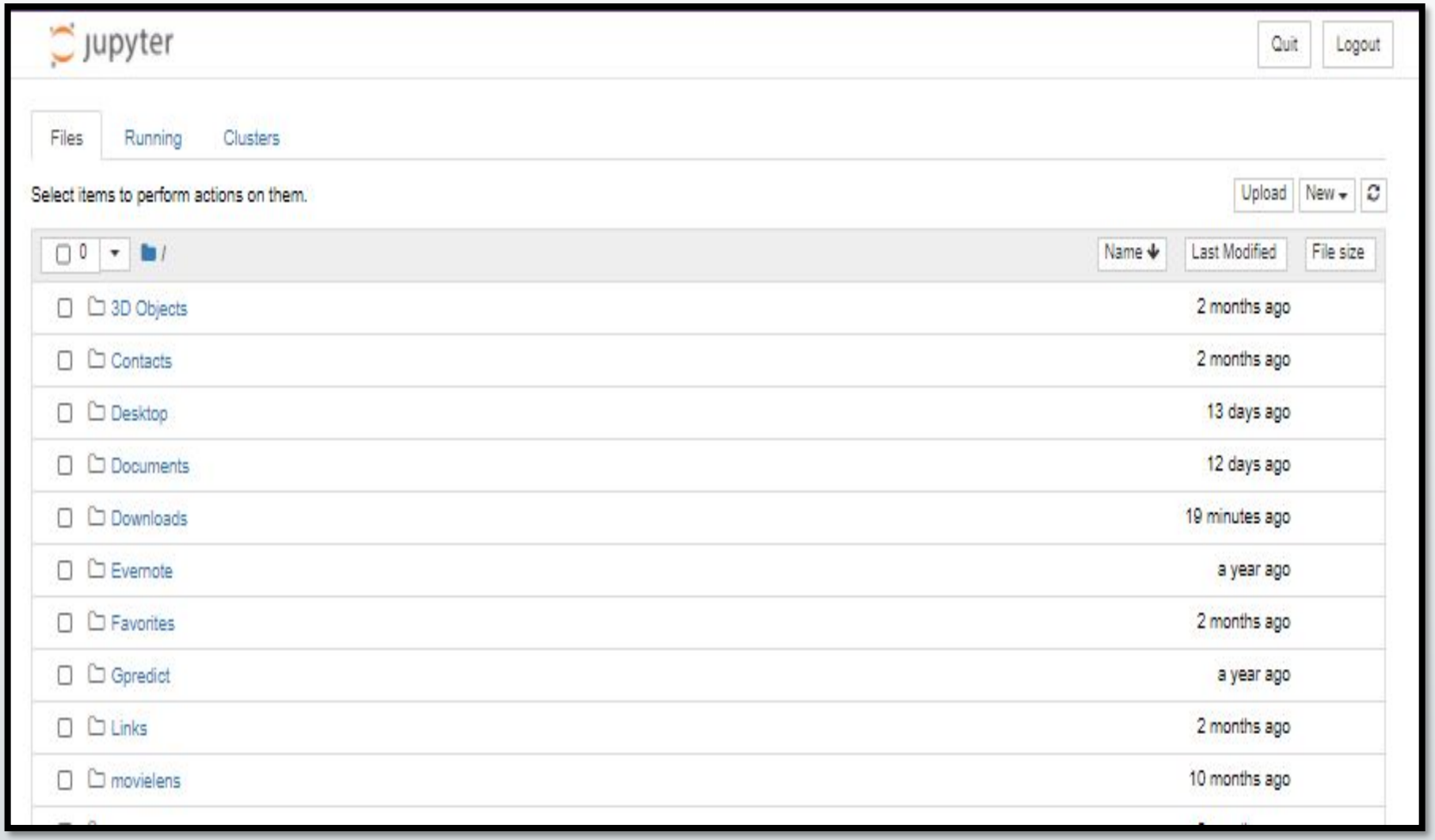
How to Launch Jupyter Notebook

3) Clicking on the Jupyter Notebook App in the Start Menu (I just learned about this method, and it will probably be the fastest!)



How to Launch Jupyter Notebook

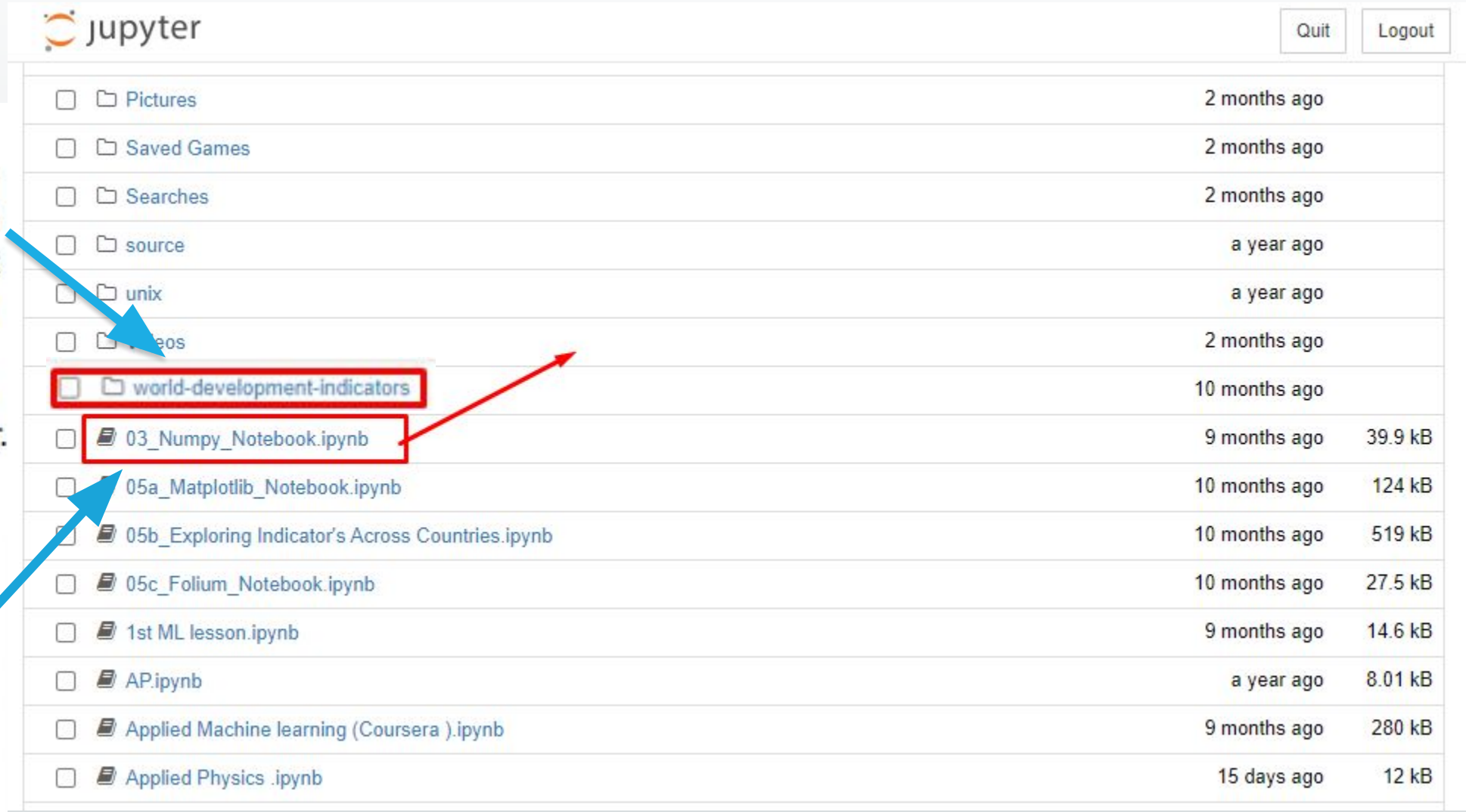
You will know that Jupyter Notebook opened correctly if you see a page similar to this one open in your browser!



How to open a Notebook file

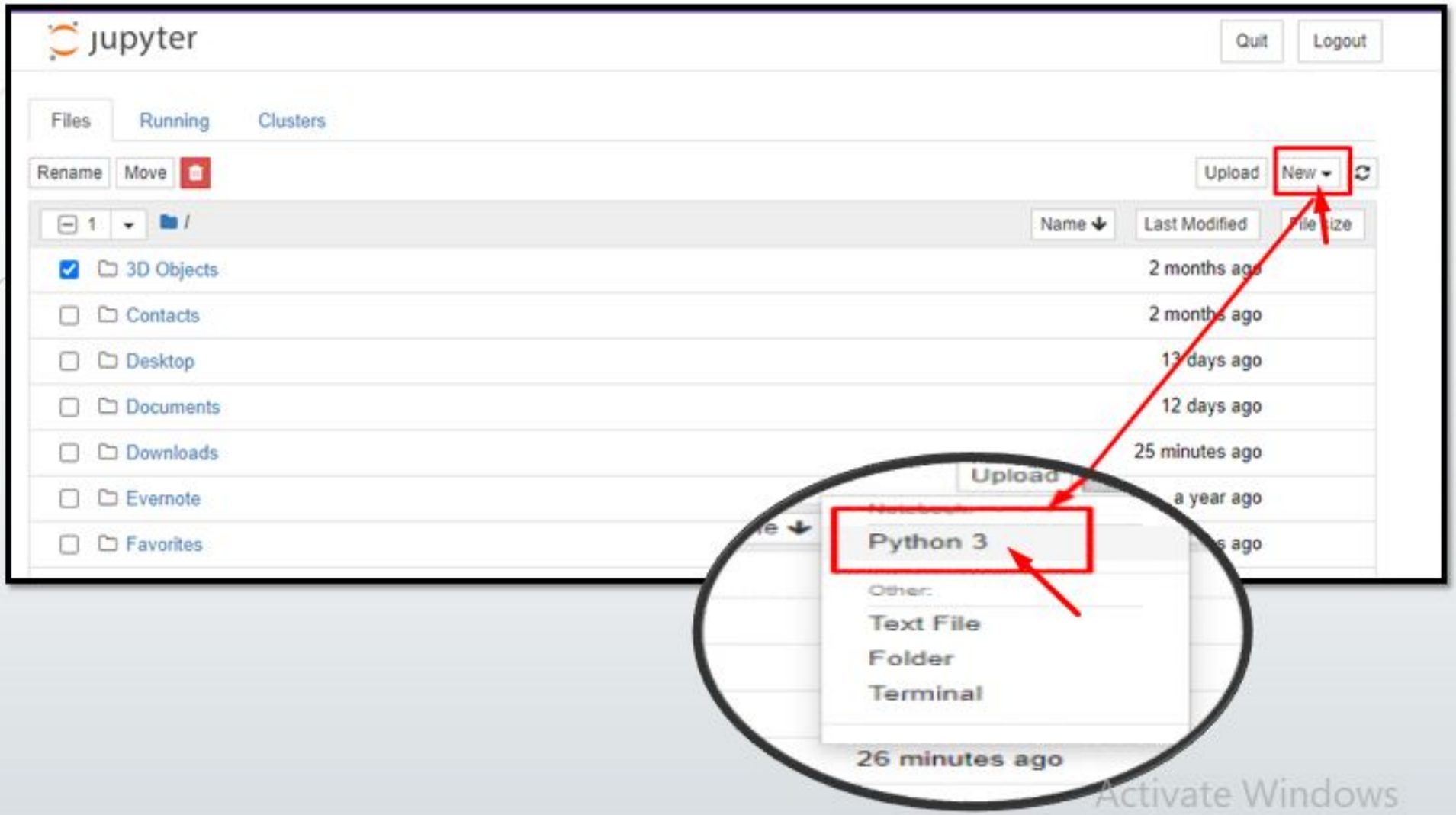
Navigate through your folders until you get to the directory you want to save your scripts in. You can navigate through by clicking on the name of the Folder.

- **Open a previously saved Notebook file** by clicking on the name of the file
- The extension for a Jupyter Notebook file is ".ipynb", which is short for "interactive python notebook"



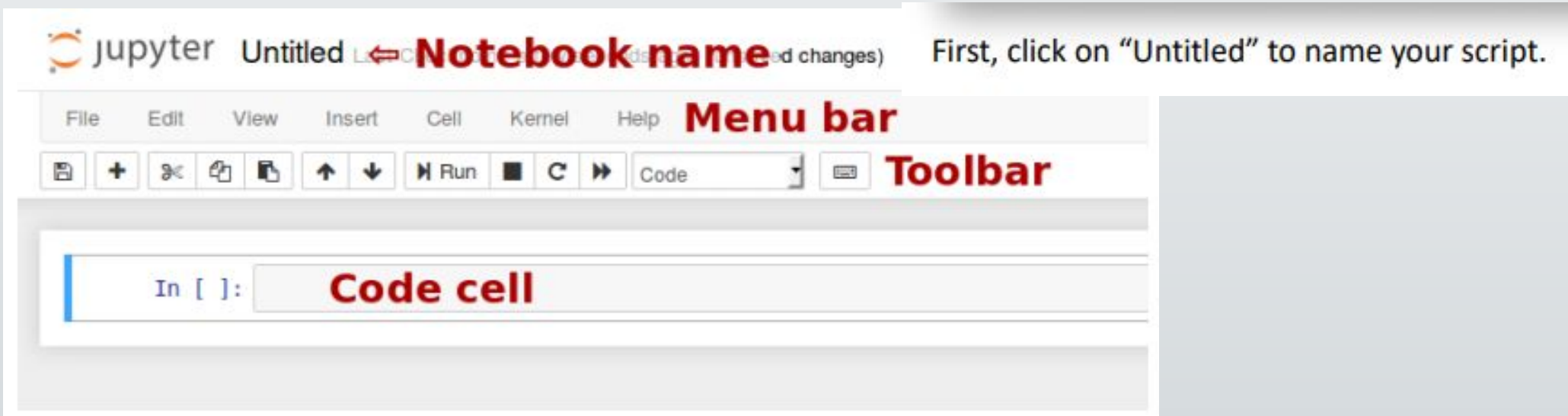
How to open a Notebook file

Open a new Notebook file by clicking on the "New" menu on the upper right



How to start writing a Jupyter Notebook

Notebook name: The name displayed at the top of the page, next to the Jupyter logo, reflects the name of the . ipynb file. Clicking on the notebook name brings up a dialog which allows you to rename it. Thus, renaming a notebook from “Untitled0” to “My first notebook” in the browser, renames the Untitled0.ipynb file to My first notebook.ipynb.
Menu bar: The menu bar presents different options that may be used to manipulate the way the notebook functions.
Toolbar: The tool bar gives a quick way of performing the most-used operations within the notebook, by clicking on an icon.
Code cell: the default type of cell; read on for an explanation of cells



How to start writing a Jupyter Notebook

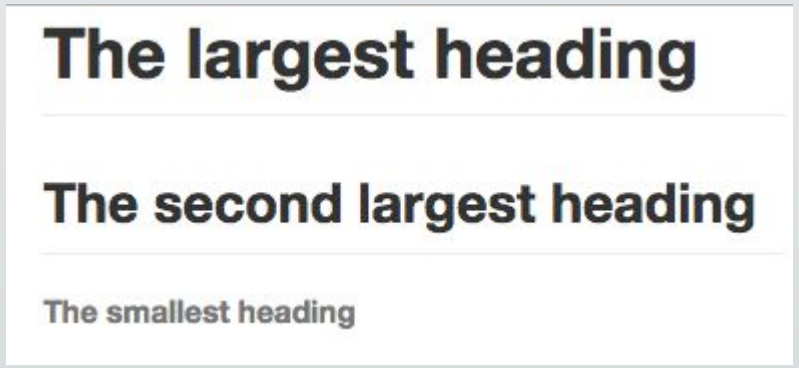
It's good practice to start your script by importing libraries you will need.
Below are three libraries I often use, but you may need different ones.

Markdown

Headings

To create a heading, add one to six `#` symbols before your heading text. The number of `#` you use will determine the size of the heading.

```
# The largest heading
## The second largest heading
###### The smallest heading
```



Text

Output	Syntax
emphasis	`*emphasis*`
strong	`**strong**`
`code`	`` `code` ``

```
Emphasis, aka italics, with *asterisks* or _underscores_.

Strong emphasis, aka bold, with **asterisks** or __underscores__.

Combined emphasis with **asterisks and _underscores_**.

Strikethrough uses two tildes. ~~Scratch this.~~
```

Emphasis, aka italics, with *asterisks* or *underscores*.

Strong emphasis, aka bold, with **asterisks** or **underscores**.

Combined emphasis with **asterisks and *underscores***.

Strikethrough uses two tildes. ~~Scratch this.~~

Styling text

You can indicate emphasis with bold, italic, or strikethrough text.

Style	Syntax	Keyboard shortcut	Example	Output
Bold	`** **` or `__ __`	command/control + b	`**This is bold text**`	**This is bold text**
Italic	`* *` or `_ _`	command/control + i	`*This text is italicized*`	*This text is italicized*
Strikethrough	`~~ ~~`		`~~This was mistaken text~~`	~~This was mistaken text~~
Bold and nested italic	`** **` and `_ _`		`**This text is _extremely_ important**`	**This text is *extremely* important**
All bold and italic	`*** ***`		`***All this text is important***`	***All this text is important***

Lists

Create an ordered list using numbers:

```
1. Number theory
2. Algebra
3. Partial differential equations
4. Probability
```

1. Number theory
2. Algebra
3. Partial differential equations
4. Probability

Create an unordered list using an asterisk * for each item:

```
* Number theory
* Algebra
* Partial differential equations
* Probability
```

- Number theory
- Algebra
- Partial differential equations
- Probability

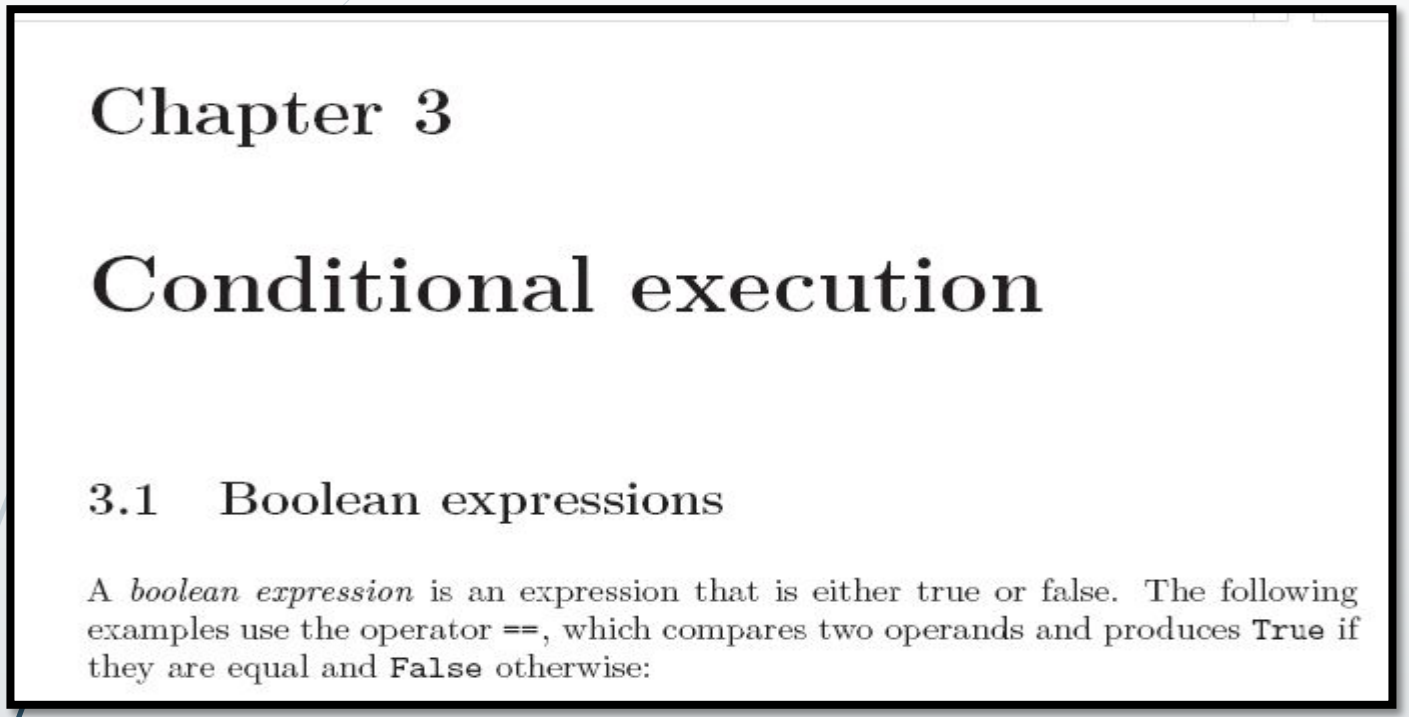
Use indentation to create nested lists:

```
1. Mathematics
  * Calculus
  * Linear Algebra
  * Probability
2. Physics
  * Classical Mechanics
  * Relativity
  * Thermodynamics
3. Biology
  * Diffusion and Osmosis
  * Homeostasis
  * Immunology
```

1. Mathematics
    - Calculus
    - Linear Algebra
    - Probability
2. Physics
    - Classical Mechanics
    - Relativity
    - Thermodynamics
3. Biology
    - Diffusion and Osmosis
    - Homeostasis
    - Immunology

Goal Lab-1

Prepare the code of the following three output on Jupyter notebook using markdown

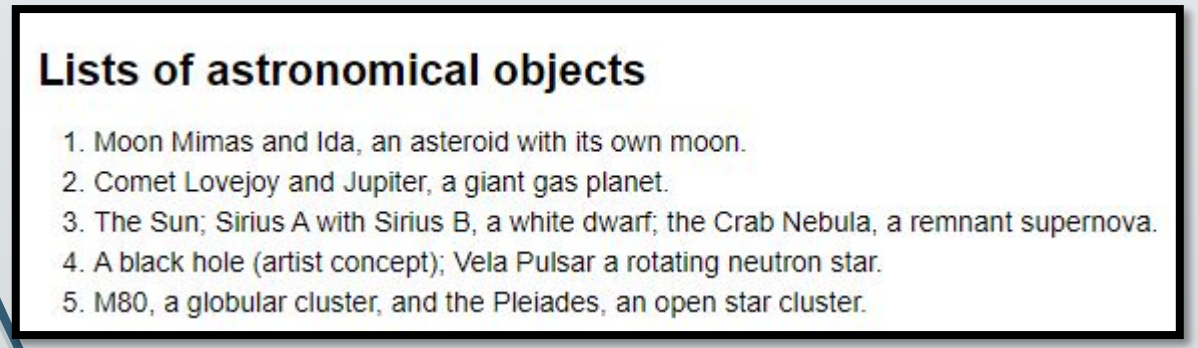


Chapter 3

Conditional execution

3.1 Boolean expressions

A *boolean expression* is an expression that is either true or false. The following examples use the operator ==, which compares two operands and produces `True` if they are equal and `False` otherwise:



Lists of astronomical objects

1. Moon Mimas and Ida, an asteroid with its own moon.
2. Comet Lovejoy and Jupiter, a giant gas planet.
3. The Sun; Sirius A with Sirius B, a white dwarf; the Crab Nebula, a remnant supernova.
4. A black hole (artist concept); Vela Pulsar a rotating neutron star.
5. M80, a globular cluster, and the Pleiades, an open star cluster.

Galaxy groups and clusters

- List of galaxy groups
- List of galaxy clusters
  - List of Abell clusters
- List of galaxy superclusters

Black holes

- Lists of black holes
  - List of black holes
  - List of most massive black holes
  - List of nearest black holes