Introduction to Programming

Lab 1: First Python Programs

Summary

- Install Python.
- Run tests in the console.
- Write some programs to implement calculations.

Task 1 – Install Python

Suggested method: Install Anaconda (works on Windows, MacOS, Linux)

- You can download it at: https://www.anaconda.com/ (recommended), or through the University of Dundee AppsAnywhere system.
- If you use anaconda:
    - Get the 'Graphical Installer' version.
    - If you are on a Mac, hopefully you know if you have an 'Apple Silicon (also known as 'ARM')' chip, or Intel.
- After install, Run Spyder.

Figure 1: Anaconda Installers

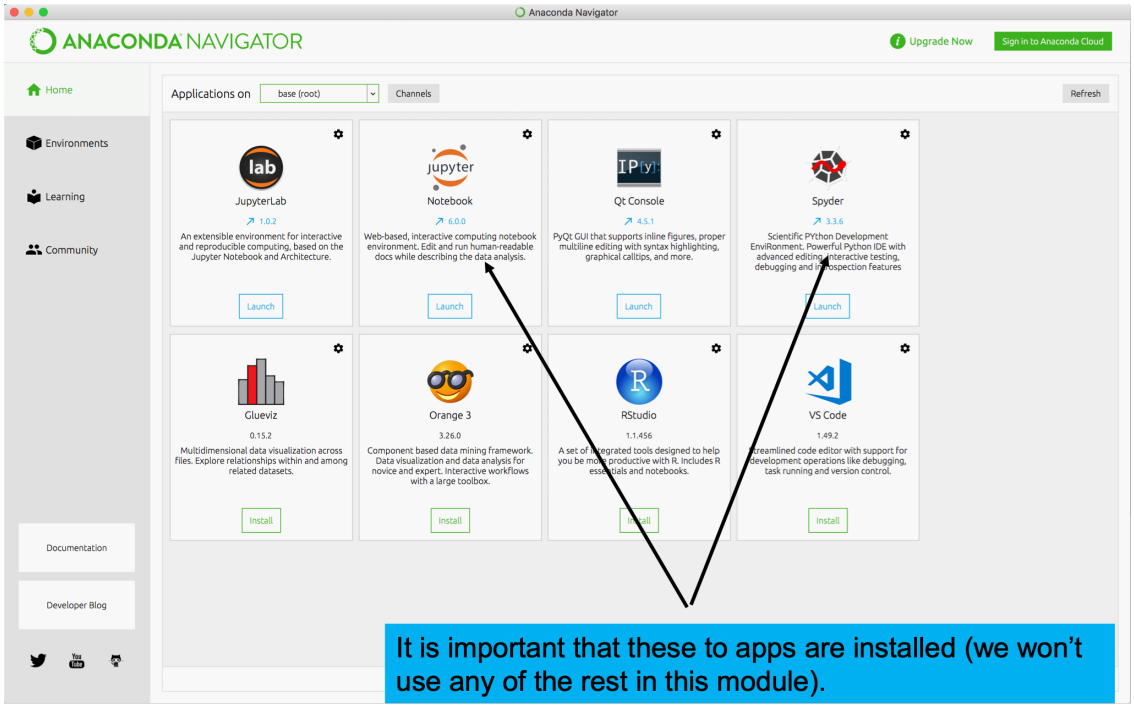

Figure 2: Installation options

We will use Spyder as our main work environment. It should look something like this.

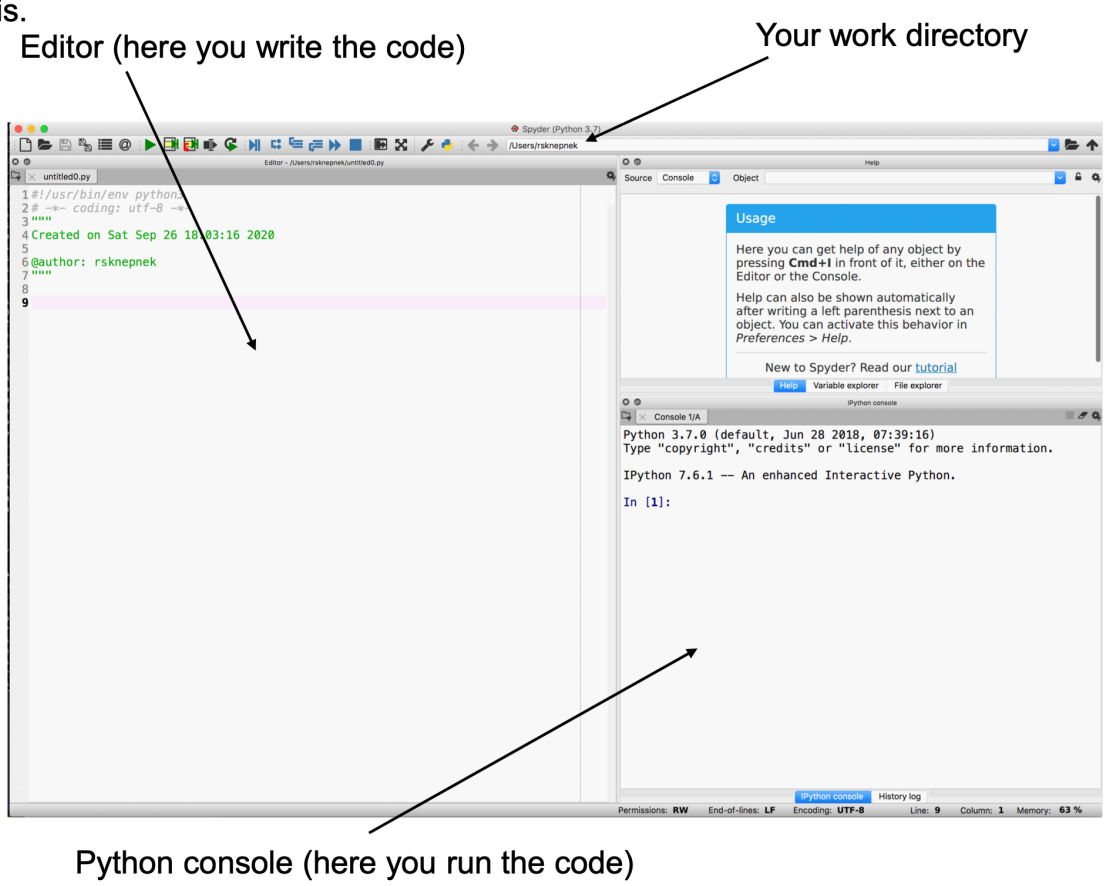

Figure 3: Spyder IDE

After the installation is complete, please run the Spyder application. This might take some time (especially if you are using an older computer), so please be patient. You can use other editors if you like, but we will use Spyder throughout this course, and won't be able to help you if other editors start misbehaving!

Task 2 – Environment and Console

Task 2.1 We will start by familiarizing ourselves with Spyder. Check out the panel layout and try to move panels around. Pay attention to the tabs at the bottom of each panel. Try to start the IPython console (Menu: Consoles → Open an IPython console).

Task 2.2: Customize the IPython consoles to fit your preferences (Menu: Tools→Preferences, then IPython console)

Task 2.3: Test the IPython console. The best start is to use it as a simple calculator.

Type "1+1" (without quotes) and hit enter. What happened?

Now type "1+1", but this time with quotes, and hit enter. What is the difference?

What happens if you write 1+'test'? (Note single quotes around word *test.*)

Try more complicated evaluations. What is 2^{108}? (Note, in Python powers are denotes as **, so you'll write 2**108)

What is 3**-0.761?

Test the operator precedence. What is 2 + 3 * 4 and what is (2+3)*4? Are they different?

Write your name (without quotes) and hit enter. What happened? Now try to put quotes around it and hit enter again. What happened now?

Task 3 – Run code from a new source file

Task 3.1: *C*reate a new source code file and modify the comments at the start of the file to apply to you.

Task 3.2: Write a Python program to add three numbers together and output the result. Write a single comment to ensure you are familiar with that process.

Task 3.3: Write a program that assigns value 10 to variable x and value 15 to variable y. Then it prints the sum (x+y), the difference (x-y), the product (x*y) and the division (x/y) of those two variables.

Task 3.4: Write a Python program to convert degrees Fahrenheit to Centigrade!

- Specify a value in Fahrenheit, your program then outputs the value in Centigrade.
- Hint: Formula is $F = \frac{9C}{5} + 32$, if F represents Fahrenheit and C represents Centigrade.
- Extend the program to convert Centigrade back to Fahrenheit and see if you can get back the original temperature in Fahrenheit (as a confirmation test that your code is working correctly).

Task 3.5 (A little harder): Write a Python program to implement **Heron's** formula to calculate the area of a triangle.

- Define values for the triangle side lengths as a, b and c, the program outputs the Area of the triangle.
- *Hint- 1: Formula is* $A = \sqrt{s(s-a)(s-b)(s-c)},\ where\ s = \frac{1}{2}(a+b+c)$
- *Hint 2: Use the math.sqrt function. See Lecture 1 slides for examples importing the maths library.*
- How can you test that your solution is correct?
    - Define *Test Cases*, which are specific values of *a*, *b* and *c* where you calculate the expected result yourself and check that you programme behaves the same way.

Task 3.6 . Look up math function in Python documentation, choose some and implement a small test with it.

- Look up the math library from docs.python.org. *hint: try searching for python docs math.*

- Browse through the list of functions.
- Try implementing a program (you choose what to do) that uses one or more of these maths functions.