15-110: Principles of Computing, Fall 2017

Lab 2 – Thursday, September 7

Goals

- Learn how to use Autolab
- Learn more UNIX commands
- Learn how to interact with Python3
- Create and test simple Python programs

Part 1 : General Information

1.1 Piazza

a. If you have used Piazza in the past, you should be able to access it by clicking Piazza on Canvas. If you have not used it before but you are registered for the course, you should have received an email to sign up for the free service. If you need help or have any questions, please ask one of the TAs!

1.2 Autolab

a. You should make all submission for Labs and Programming Assignments (PA) on Autolab (`https://autolab.andrew.cmu.edu`).
b. In order to see your submissions, click the 'View handin history' button. Note that only your **last submission will be graded**.
c. If you click the magnifying glass icon next to your submission, you should be able to see all files in the zipped folder that you have submitted. If you click the magnifying glass icon next to each file, you should be able to see the content of the file.
d. For each submission, make sure you double check if you have submitted the right work.

Part 2 : Introduction to Terminal (continued)

2.1 More UNIX Commands

a. **`mkdir`** *`directory`*: make *`directory`*

```
-bash-4.2$ cd private
-bash-4.2$ mkdir 15110
-bash-4.2$ ls
```

```
15110     lab1.txt     lab1.zip
-bash-4.2$ mkdir lab2
-bash-4.2$ ls
15110     lab1.txt     lab1.zip     lab2
```

b. **mv** *file_name directory*: move *file_name* to *directory*

```
-bash-4.2$ mv lab1.txt 15110
-bash-4.2$ ls
15110     lab1.zip     lab2
-bash-4.2$ mv lab1.zip 15110
-bash-4.2$ ls
15110     lab2
```

c. **mv** *directory1 directory2*: move *directory1* into *directory2*

```
-bash-4.2$ mv lab2 15110
-bash-4.2$ ls
15110
-bash-4.2$ cd 15110
-bash-4.2$ ls
lab1.txt     lab1.zip     lab2
```

d. **rm** *file_name*: remove *file_name* from current directory

```
-bash-4.2$ gedit dummy.txt &
-bash-4.2$ ls
dummy.txt     lab1.txt     lab1.zip     lab2
-bash-4.2$ rm dummy.txt
-bash-4.2$ ls
lab1.txt     lab1.zip     lab2
```

e. **rm –r** *directory*: remove *directory* from current directory

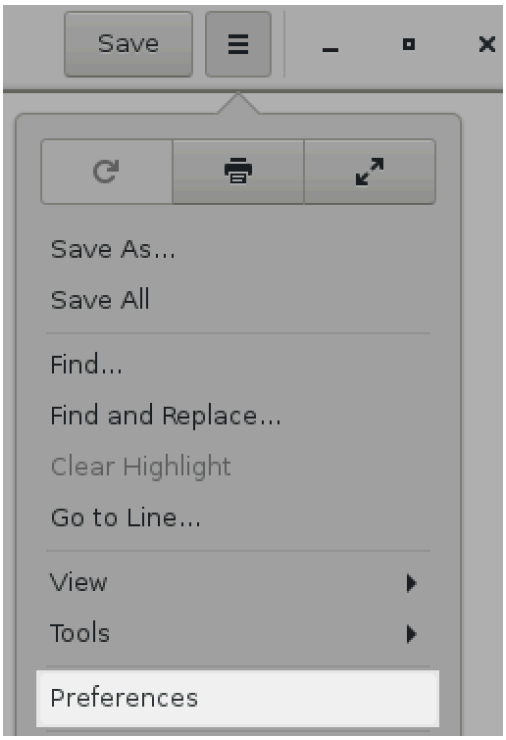
```
-bash-4.2$ mkdir dummy
-bash-4.2$ ls
dummy     lab1.txt     lab1.zip     lab2
-bash-4.2$ rm –r dummy
-bash-4.2$ ls
lab1.txt     lab1.zip     lab2
-bash-4.2$ cd lab2
```

f. **zip –r** *file_name.zip directory*: zip all the files in *directory* and name the zipped file as *file_name.zip*

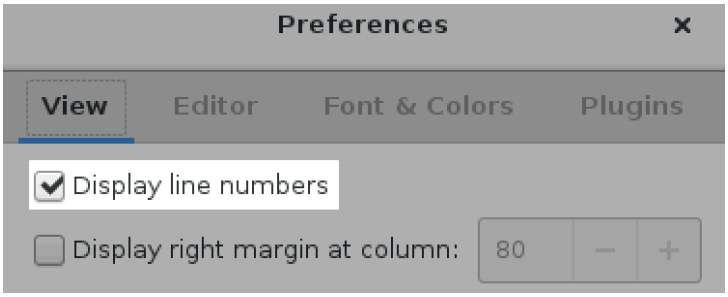
2.2 Gedit Setup

a. Open gedit by typing ‘gedit’ in Terminal.

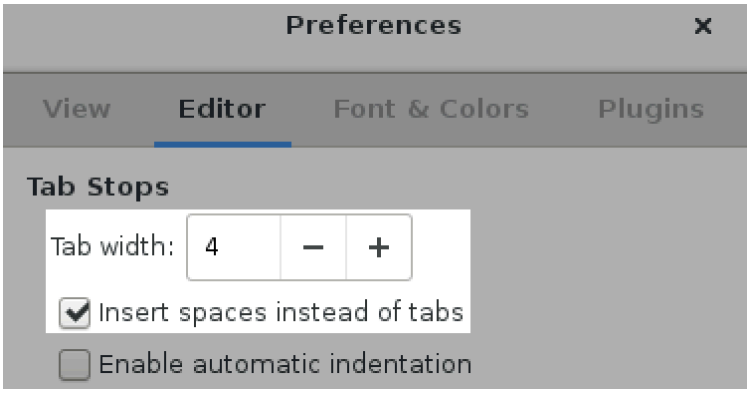
b. Click the ‘Preferences’ button.



c. Turn on the 'Display line numbers' option under the 'View' tab.



d. Click the 'Editor' tab. Set tab width to 4 spaces and turn on the 'Insert spaces instead of tabs' option.



Part 3 : Basic Expressions in Python Shell

3.1 Running Python3 in Terminal [TA Demonstrations]

a. Type '`python3`' in Terminal.

```
-bash-4.2$ python3
Python 3.4.5 (default, May 29 2017, 15:17:55)
[GCC 4.8.5 20150623 (Red Hat 4.8.5-11)] on linux
Type "help", "copyright", "credits" or "license" for more
information.
>>>
```

The prompt >>> on the last line indicates that you are now in an interactive Python interpreter session, also called the Python shell. This is **different from the normal terminal command prompt**!

b. You can now enter some expression for Python to run. Type '`5 + 10`' and press the `Enter` key.

```
>>> 5 + 10
15
>>>
```

Note that after showing the result, Python brings you back to the interactive prompt, where you can enter another command.

```
>>> 10 * 2
20
>>> 15 – 110
-95
```

c. You can exit the Python shell by typing '`quit()`' or holding down the `Ctrl` and `D` keys at the same time.

```
>>> quit()
-bash-4.2$
```

3.2 Basic Expressions in Python Shell [Student Activities]

First, create a text file `answers.txt` using gedit. Then, type each of the following expressions into the Python shell. What **value** does each of the following Python expressions evaluate to? Is the value an **integer** or a **floating point**? Write your answers in `answers.txt`.

a. `28 % 5`

b. First, type '`20 + 35 * 2`' and press the `Enter` key. What do you get? Now, type '`(20 + 35) * 2`' and press the `Enter` key. What do you get? Why are they different?

c. First, type '`2 / 3 * 3`' and press the `Enter` key. What do you get? Now, type '`2 // 3 * 3`' and press the `Enter` key. What do you get? Why are they different?

d. `2.0 ** 6`

Part 4 : Basic Functions in Python

4.1 Creating and Using Functions [TA Demonstrations]

a. Create a file `add.py` using gedit. In `add.py`, define a function `add(x, y)` that takes two parameters `x` and `y` and **returns** their sum.

b. Load `add.py` by typing '`python3 –i add.py`' in Terminal.

Test the function using different arguments.

```
>>> add(4, 5)
9
>>> add(12, -7)
5
>>> add(3, 0)
3
```

4.2 Using Built-In Functions [TA Demonstrations]

a. Create a file `circle.py` using gedit. In `circle.py`, define a function `circle_area(r)` that takes one parameter `r` and **returns** the area of the circle whose radius is `r`. (Note that the mathematical formula to find a circle's area is $\pi \cdot r^2$.)

b. Where can we find π in Python3?

c. Add a comment to explain what `r` means by typing # at the beginning of the line.

d. Load `circle.py` by typing '`python3 –i circle.py`' in Terminal.

Test the function using different arguments.

```
>>> circle_area(1)
3.141592653589793
>>> circle_area(3)
28.274333882308138
>>> circle_area(10)
314.1592653589793
```

4.3 Creating and Using Functions [Student Activities]

a. Create a file `sphere.py` using gedit. In `sphere.py`, define a function `sphere_volume(r)` that takes one parameter `r` and **returns** the volume of the sphere whose radius is `r`. (Note that the mathematical formula to find a

sphere's volume is $\frac{4}{3} \cdot \pi \cdot r^3$.)

In `answers.txt`, place a copy of your interaction with Python3. That is, load `sphere.py`, call `sphere_volume(r)` with any radius, and copy and paste what you see (including the result) in Terminal to `answers.txt`.'

b. Pick a mathematical formula that is used in your major or that interests you. Create a file `my_function.py` using gedit. In `my_function.py`, define a function that calculates and **returns** some value using the formula.

At the beginning of your `my_function.py`, include comments that describe what the function computes and what each parameter is.

c. **If you have time**, create a file `hypotenuse.py` using gedit. In `hypotenuse.py`, define a function `hypotenuse(a, b)` that takes two parameters `a` and `b` and **returns** the length of the hypotenuse `c` of a right triangle whose side lengths are `a` and `b`. (Note that the Pythagorean Theorem states that $c^2 = a^2 + b^2$.)

In `answers.txt`, place a copy of your interaction with Python3. That is, load `hypotenuse.py`, call `hypotenuse(a, b)` with any side lengths, and copy and paste what you see (including the result) in Terminal to `answers.txt`.

Submission

When you finish the lab, you should be inside the `lab2` folder, which is inside the `private/15110` directory. When you type '`ls`' and press the `Enter` key, you should see the following files:

a. `answers.txt`
b. `add.py`
c. `circle.py`
d. `sphere.py`
e. **(If you have time)** `hypotenuse.py`
f. `my_function.py`

Once you see all files, please type '`cd ..`' and press the `Enter` key. Then, zip your `lab2` folder by typing '`zip –r lab2.zip lab2`'. Please submit the zipped file `lab2.zip` on Autolab.