

Lab 8

Problem 0 is due on Zybook at the end of the lab session.

All other problem are due **Wednesday 4/10/19** at 11:59 p.m. on Canvas and Zybook

Please follow the usual homework guidelines (honor code, code style requirements).

Read the entire assignment before starting your work in order to plan your time.

For the linked list problems, please import the `Node.py` class at the top of your files using:
`from Node import *`

0. Together in the lab, lab8pr0.py, Zybook

Modified lab rules for this problem only: Work on the problems in this exercise **together** in the lab. You can team up with one or more students without having to list their names, and you can discuss hints and (partial) solutions together with the instructor in the lab. This is your time to practice, so make the best use of it.

Upload one python file that contains:

- `from Node import *` at the top of the file.
- The entire debugged code (`removeSpaces(s)`, a few lines of code, `removeSpaces(L)`, a few lines of code).
- The `Person` class.
- The `toString(head)` function.

(a) Debugging exercise: Strings and Lists

```
i. def removeSpaces(s):
    newS = None
    for c in s:
        if c!=" ":
            newS += c
    s = newS
```

```
myString = "Hello world"
removeSpaces(myString)
print(myString) #Should print "Helloworld"
```

The code above is supposed to print `Helloworld` . Your task is to debug it.

- A. Run the code in IDLE. What kind of error do you get? Fix this error, so that the program doesn't crash anymore.
- B. Now you need to fix the logic in the program. Why does it not remove the space from `myString`? Draw a picture of the objects in memory. Make *minor* modifications to the code so that it runs correctly (don't rewrite it from scratch).

```

ii. def removeSpaces2(L):
    newL = None
    for c in L:
        if c!=" ":
            newL += [c]
    L = newL

```

```

myList = ['H', 'e', 'l', 'l', 'o', ' ', 'w', 'o', 'r', 'l', 'd']
removeSpaces2(myList)
print(myList) #Should print ['H', 'e', 'l', 'l', 'o', 'w', 'o', 'r', 'l', 'd']

```

The code above is supposed to print ['H', 'e', 'l', 'l', 'o', 'w', 'o', 'r', 'l', 'd']. Your task is to debug it.

- A. Run the code in IDLE. What kind of error do you get? Fix this error, so that the program doesn't crash anymore.
- B. Now you need to fix the logic in the program. Why does it not remove the space from `myList`? Draw a picture of the objects in memory. Why does this not work, even though lists are mutable and strings aren't? Make *minor* modifications to the code so that it runs correctly (don't rewrite it from scratch).

(b) **OOP**

Define a `Person` class. A `Person` has two string attributes: `firstName` and `lastName`. Your class should have a constructor and a `__repr__` method. If a `Person` object is printed, the output should be its first name, followed by a space, and then its last name. Example:

```

>>> p = Person("Kermit", "Ruffins")
>>> print(p)
Kermit Ruffins

```

(c) **Linked Lists**

Write an **iterative** (i.e., non-recursive) function `toString(head)` that returns a string representation of the linked list with head node `head`. For the linked list `head->'alpha'->'beta'->'gamma'` the output should be:

```

>>> toString(head)
alpha->beta->gamma->

```

1. **Time lab8pr1.py, Zybook**

Suppose we are writing an application for a military purpose, and we find that we need to keep and use time in 24-hour format also known as military time. Write a class `MilClock`. Its attributes will be hours and minutes. Its methods should at minimum include the constructor, the `__repr__` function that should return time as a string in `hh:mm` format, and a method `addOne()` that adds one minute to the current value of the clock. Place your `MilClock` class in a separate file `milclock.py`.

From the course website, download the `milclockuse.py` test file and place it in the same folder with your `lab8pr1.py`. When your `MilClock` is correct, you should be able to run that test file and get the following output:

We wake up at 05:00
We get up at 05:30
We are sleepy again by 06:10
Last tram leaves at 23:00
Today ends at 23:59
Tomorrow starts at 00:00

2. Linked Lists lab8pr2.py, Zybook

The first line of lab8pr2.py should be: `from Node import *`
All nodes in this exercise are Node objects.

- (a) Write a **recursive** function `toStringRec(head)` that returns a string representation of the linked list with head node `head`. For the linked list `head->'alpha'->'beta'->'gamma'->` the output should be:

```
>>> toStringRe(head)
alpha->beta->gamma->
```

- (b) Write a function `findElement(head,i)` that returns the data element at the i -th position of the linked list with head node `head`. Just like in an array, positions (or indices) start with 0. Your function needs to work for all $i \geq 0$, and it should return `None` if the i -th element does not exist. So, for the linked list `head->'alpha'->'beta'->'gamma'->` the output would be:

```
>>> findElement(head,0)
alpha
>>> findElement(head,2)
gamma
>>> findElement(head,3)
None
```

3. Internet for greater good lab8pr3.txt, Canvas

This week we continue our exploration of the impact that computing technology is making on societies and humanity in general, and turn our attention to positive sides of this impact.

Watch the TED talk by Luis von Ahn "Massive-scale online collaboration" (17 minutes):
https://www.ted.com/talks/luis_von_ahn_massive_scale_online_collaboration

Then answer these questions:

- (a) How does Duolingo deal with the fact that people who translate the texts are not professional translators and are beginning learners? How can this approach be applied in other areas of life (provide an example).
- (b) What other good products or ideas came out of online collaboration of volunteers over the Internet? Search the web and talk to your circle of friends to generate at least two example products, websites, or technologies. Have you taken part in any such initiative? If yes, please share your experience.
- (c) In your opinion, what are other advantages and advances that personal computers and connecting them via the Internet has brought to humanity? Give at least three 1-2 sentence examples. (Try to focus on implications. It's clear that computers help us crunch the numbers faster than we would have done manually, but what implications does this ability have on our everyday life of a person, society, or humanity in general?)