ENGR 102 - Lab Assignment #3

Fall 2020

General course learning outcomes:

- demonstrate the use of basic programming techniques in the construction of computer programs, including techniques to collect, store, and manipulate data within a computer program.
- apply programming techniques to solve problems in engineering.
- complete a team programming assignment that ties together concepts learned in the class.

Activity 1: Inputs and Outputs - to do in lab (team)

☑ *Find unit conversion values and create computational Python programs to perform the conversions.*

As a team, write a program that makes the following five unit conversions. Ask the user for input in the first given unit, convert it to the following unit, and output the answer. Then, repeat the process for the following four unit conversions. Have your program proceed through all five conversions sequentially.

A) Pounds to Newton

B) BTUs to Joules

C) Miles per Hour to Meters per Second

D) Fahrenheit to Celsius

The activity of unit conversions might seem very basic, but it's also critically important. Conversion (a) above has a particularly costly history. Before your team leaves today, find and read a little bit about the Mars Climate Orbiter, then read these two statements from NASA:

https://mars.nasa.gov/msp98/news/mco990930.html and *https://mars.nasa.gov/msp98/news/mco991110.html*

Activity 2: A Very Merry Unbirthday - to do in lab (team)

☑ *Create appropriate list of variables, and plan how to create a Python program.*
☑ *Create Python program to read user input, perform necessary data reformatting, and print the expected output.*

Write a program that will read in four people's names and birthdays, and output them in formatted columns.

A) First, as a team, create a document for submission (you'll submit a PDF version) and write a list of the variables that your team will use in this program. Your list should include:
   a. The variable names
   b. The type of each variable
   c. A *brief* description of what each variable is (you can write one description for multiple variables if it is clear what they all are).

B) Next, determine what instructions you want to give to the users and write a description in your document. Determine the text you want to tell the users. Be specific about the way you want them to enter information!

C) Third, write a description of how you want the output to be formatted. Consider how you want to align the various columns of the document (information should be lined up in clear columns).

D) Fourth, and only after completing the above, write your code as a team. Write a Python program that asks four users for the data described, fills the appropriate variables, and outputs the result in the format you described. You should test your program to make sure it works as expected.

(continued, next page)

Activity 3: Little Purple Barking Hood - to do in lab (team and individual)

☑ *Create an appropriate list of variables and plan for the program.*
☑ *Write a Python program to take user input, and format output in an organized manner.*
☑ *Utilize escape characters within your program.*

Building on what we learned about escape characters in strings (the `\'` and `\"` options), there are some other "escape sequences" in Python, all beginning with a `\` character. Try experimenting by printing out strings containing the following escape characters, to see what they do:

`\n`, `\t`, `\\`, `\b`.

If you cannot deduce what these do, feel free to look them up in an online Python guide. Make sure that *each member* of your team understands how each of these characters work.

You will each write a program to generate mad-libs. A mad-lib is a short story in which a person is asked for general terms (e.g. "Number" and "Noun"), and then that word is inserted into a story. For instance, if the person entered "4" and "Giraffe", the story might read: "I was 4 years old when I sailed a Giraffe down the Amazon River."

A. As a team, decide on at least 6 and no more than 10 different inputs that you will ask a user for.
    a. Agree on these as a team (e.g., they can be things like "A person's name", "A location", "A color", "Verb ending in –ing", "Adjective", "Noun")
    b. Agree on the order of the inputs (which will come in the story first, second, etc.)
    c. At least one input should be a numerical value

B. Each member should individually write a mad-lib program that forms a story using these inputs. The story should:
    a. Generate several sentences in a story that incorporates all of the input the user typed in.
    b. Utilize all of the inputs in the correct order.
    c. Present the story in a nicely formatted manner. The lines of text should be of reasonable length and flow into each other, without having single words on a line (unless at the end of a paragraph), etc.
    d. Your text must make use of the following three escape characters somewhere within the text: `\n`, `\t`, and `\'`

C. Test each other's programs.

D. Submit all four team members programs; clearly identify which program belongs to each member.