ENGR 102 - Lab #3

Activity #1: To do in lab (Team) – Unit Conversions

This activity is meant to help illustrate the process of asking a user for input and then reading their input, performing processing, and outputting a result. Many programs will follow that basic format.

As a team, write the following short programs. For each one, you are to write a program that converts from one type of unit to another. You should ask the user for input in one unit, convert it to the other unit, and output the answer in the converted units. Please be sure to include comments to make it easy for the reviewer to understand. Do so for each of the following conversions. For each, write a separate program (labeled 1a – 1h) and turn in all files together.

A.   Pounds to Newtons

B.   BTUs to Joules

C.   Pascals to Millimeters of Mercury

D.   Seconds per revolution to Hertz

E.   Miles per Hour to Meters per Second

F.   Fahrenheit to Celsius

G.   Voltage to voltage level (power gain) measured in Decibel Volts (dBV) – for a reference of 1 volt

H.   Differences in two Richter scale values to the ratio of energy released in two earthquakes

This sort of activity (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, please search and read a little bit about the Mars Climate Orbiter, and read the two statements from NASA:

● https://mars.nasa.gov/msp98/news/mco990930.html

● https://mars.nasa.gov/msp98/news/mco991110.html

Notice from the statements both the root cause of the failure, and the contributing factors.

Activity #2: To do in lab (Team) – Strings and Calculations

This activity is meant to give your team a chance to write a number of programs, together.

A.   Write a Python program to print the following string in a specific format (see the output).

Sample String: "Twinkle, twinkle, little star, How I wonder what you are! Up above the world so high, Like a diamond in the sky. Twinkle, twinkle, little star, How I wonder what you are"

Output:

Twinkle, twinkle, little star,

How I wonder what you are!

Up above the world so high,

Like a diamond in the sky.

Twinkle, twinkle, little star,

How I wonder what you are

B.   Write a Python program to display the current date and time. (Hint: Check out the datetime module) https://docs.python.org/3/library/index.html

C.   Write a Python program to determine two random numbers between 0 and 1 and display both. (Hint: Check out the random module) https://docs.python.org/3/library/index.html

D.   Write a Python program that will prompt the user to enter two numeric values, x and y. Compute and print the following operations:

a. e^{-x}

b. xy

c. $\sin(x + y)$

d. x/y

e. $x^2 + y^2$

Activity #3: To do in lab (Team and as Individuals) -
The purpose of this activity is to practice working with strings.

First, 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 those characters work.

You are each going to write a short program to generate mad-libs. A mad-lib is a short story in which a person is asked for some general terms (e.g. "Number from 10 to 18" and "Name of a river"), and then that term is inserted into some story. For instance, if the person entered "15" and "Brazos", then the story might read: "I was 15 years old when I decided to sail a raft down the Brazos River."

A.   As a team, decide on at least 5 and no more than 10 different inputs that you will ask a user for. Agree on these as a team (e.g. they can be things like "A person's name", "The name of a city", "A color", "A word ending in -ing".

a.   At least one of these inputs should be a numerical value.

B.   Then, each member should individually write a mad-lib program that forms a story using those inputs. The story should:

a.   Perform at least one computation on the numerical input. For example, you might ask for an age in years, and convert it to months.

b.   Generate several sentences in a story that incorporates all of the input the user typed in.

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 should make use of the escape characters: \n, \t, and either \' or \", somewhere within the text.

C.   Try out other teammates' programs. Students should turn in their programs individually