LAB #4
More Programming w/ Python

1. In this course, all our labs involve paired programming. You do not have to keep the same partner for each lab, but you MUST work with someone in each lab. Two of the ten points for each lab is based on following the paired programming model, as specified in the student handout, and turning in the pair programming evaluation with each lab.

2. At this time, you need to pair with someone in the lab, and finish the rest of the lab as a pair.

3. First, discuss how you would solve each expression based on precedence and write down your answers to the following expressions. In addition, we will follow the standard in most programming languages, where integer arithmetic is a result from using only integers. The special operator for integer division, //, is a new feature of Python 3, but this is not typical in most languages. In the following expressions, assume integer division when a divide is between integers, when determining your answers.

\[
\begin{align*}
4 / 3 / 2 \\
4 / 3.0 / 2 \\
1 / 2 * 8.0 \\
5 * 10 / 2 +10 / 5.0 \\
3 + 2 \ast 4 / 5 + 8 + 2 \\
(3 + 2) \ast 4 / (5 + 8) + 2 \\
(3 + 2) \ast 4 / 5 + (8 + 2) \\
20.0 / 4 * 2^3 \\
5.5 * 2 + 4 / 2 \\
false and true \\
not false \\
true or false \\
not true or false and false or true
\end{align*}
\]
not ((true or false) and (false or true))

not true and false

not (true and false)

false and not false or false

Using variables:

a = 0.0

b = 1.0

b – a / 10

(b – a) / 10

a = true

b = false

not a or not b

Now, look up the ASCII character set in a web browser. Determine the numbers that correspond to the letters in your full name. This includes a capital letter for your first and last name with a capital middle initial (if you have one) followed by a period, i.e. Jennifer Parham-Mocello or Jennifer R. Parham. Write down the numbers for both you and your partner.

At this point, you need to get checked off by a TA for 2 points.

4. Testing your solution: Write Python code to test your handwritten solutions.

Start a new Python project in Visual Studio. If you have not been able to get Visual Studio to work but have downloaded Python, then use the built-in Python IDLE. (Go to Python 3.2-> IDLE (Python GUI)).

Using integer division, i.e. // or type casting w/ int(), where appropriate, write a python program that prints the values of the above expressions based on the rules for integer arithmetic. Remember, the rule is that an operation between two integers produces an integer.

Example ways to write 1st expression:
print(4 // 3 // 2)
print(int(int(4 / 3) / 2))

Now, write a python program that uses the ordinal values from the ASCII character set, and then prints the characters corresponding to the values. Your name should come out with the letters beside each other and spaces between your first, middle initial, and last name. In other words, you do not want the print function to automatically insert a newline at the end.

Example:

print(chr(79), end="")

Compare your handwritten solutions with your Python solutions to see if you got the correct answer. For those answers where your handwritten solution differed from the Python solution, document what caused this error. For example, did your make a typo when entering the number in Python or a logical error when calculating your solution by hand?

At this point, you need to get checked off by a TA for 2 points.

5. Next, using your design from Lab #3, modify your program that takes the weight (in pounds) and radius (in feet) of a sphere as input and outputs the buoyant force. Use $\gamma = 62.4 \text{ lb/ft}^3$ as the specific weight of water, and the volume of the sphere is $(4/3)\pi r^3$. The buoyant force can be computed by

$$F_b = V \times \gamma$$

where $F_b$ is the buoyant force, $V$ is the volume of the submerged object, and $\gamma$ is the specific weight of the fluid. If $F_b$ is greater than or equal to the weight of the object, then your program will output, “This sphere will float”, otherwise it will output, “This sphere will sink.”

At this point, you need to get checked off by a TA for 2 points.

6. Now, describe how your buoyancy program would change if you asked the user if he/she wants to re-calculate the force for another object? Modify your buoyance program so that the user must enter a 1 to continue or 0 to quit.

Suppose you wanted to provide a message to the user that she/he entered an invalid number when the number is not a 1 or 0. For instance, if the user enters a
number other than 1 or 0, then the program must give an error message and re-prompt the user for a 1 or 0 to continue or quit. Write down your design for changing the program to allow for this feature.

At this point, you need to get checked off by a TA for 2 points.

7. You will have to turn in your pair programming evaluations through the TEACH website. At this point, you need to download and fill out the survey.

Now, upload your survey and presentation file to the TEACH website for the last 2 points.

Make sure you sign-up with a TA for demoing/explaining your Assignment #4 next week. This is how all assignments are graded in the course, and if you sign-up and do not make your appointment without rescheduling, then you will be penalized 50 points!!!