CSE 231 Lab Exercise #2

(Complete the Pre-Lab02 on D2L before your lab session)

★ **Partnering on this Exercise**

- you will work with a partner on this exercise during your lab session. Two people should work at one computer. To allow for both partners to practice, occasionally switch the person who is typing. The person typing should take ownership of what they write while the person without the keyboard double-checks their work. If there is disagreement or uncertainty on how to proceed, talk to each other about what you are doing and why that is the best choice.

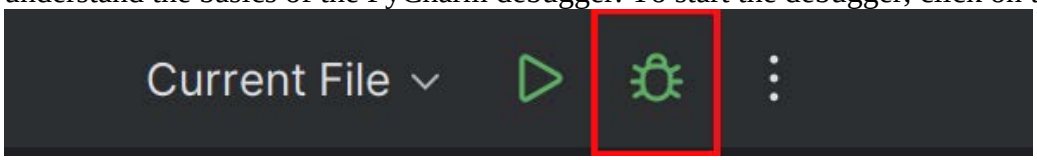
PART 1: Debugging

Assignment Background

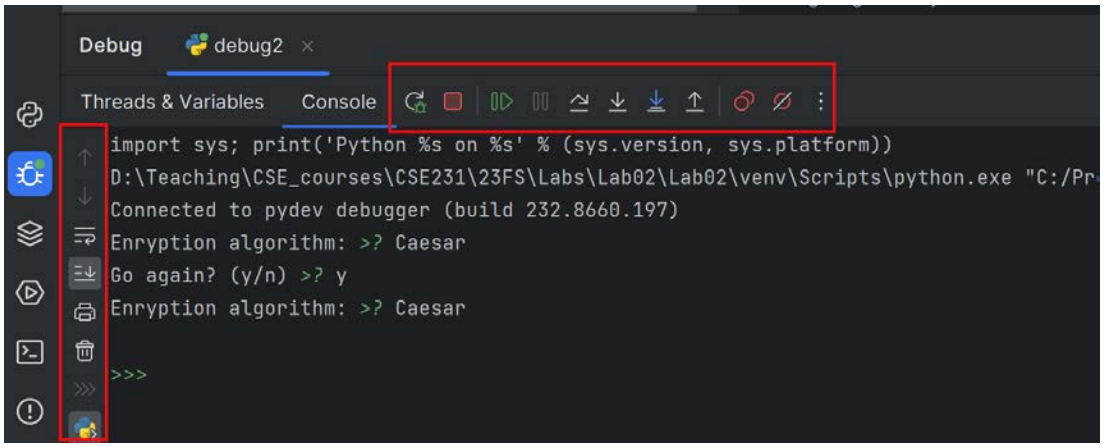
This lab exercise provides practice with debugging, meaning the process of identifying and removing errors from your code.

★ **Students should do it on their local computer with PyCharm (Do not submit to Codio).**

The art of debugging is an integral part of programming. The following exercise is designed to help you understand the basics of the PyCharm debugger. To start the debugger, click on the bug icon.



Familiarize yourself with the debug control buttons in PyCharm. They are in the left-hand side and the top of the "debug" window that appears when you start debugging your code. Hover your mouse over each one to identify what each button does.. Hover your mouse over each one to identify what each button does.



- Set breakpoints on lines by clicking to the right of any of the line numbers. Try it and you will see a red circle; click again to make it disappear.
- Run the program in debug mode by pressing the Debug button (the green bug on the top bar, or `CTRL + D`). Execution "freezes" when a breakpoint is encountered. You can then progress the

program one statement at a time by pressing the Step Over (`CTRL + F8`) button (leftmost on the top bar).

- The next line to be executed will be highlighted in the running file. You can use this along with Step Over to understand which lines of your code are executed.
- Click on the "*Threads & Variables*" tab (next to Console) to see the values stored in the variables you created.

Assignment Overview

Download the `Lab02` folder and unzip it. As before, we open the new project Lab02. Open up the file `debug2.py` in PyCharm. Set a breakpoint at the first executable line of the program (`input`) and start the debugger by pressing the "debug" button – note that it may be necessary to first choose "Current file" next to the debug button.
Answer the following questions for the input provided below and compare the results. Note: Please *do not* use `print()` statements during the debug exercise.

Input set 1
Input1: `AES`
Input2`: n`

1) As you step through the program, record the sequence of line numbers executed? (e.g. 2, 4, 9)
   ANSWER: 8, 10, 12, 13, 16, 19, 21, 8, 23

Input set 2
Input1: aes
Input2: n

2) A. Sequence of line numbers executed?
   ANSWER: 8, 10, 12, 14, 16, 18, 19, 21, 8, 23
2) B. When the next line highlighted shows that the next instruction to be executed is 14, which variables are held in memory and what are their values?
   ANSWER: Variables → values
   1. algorithm → aes
   2. go_again → y

Additional Resources
https://www.jetbrains.com/help/pycharm/debugging-your-first-python-application.html#where-is-the-problem

PART 2: Programming with Control Structures

Assignment Background

This lab exercise provides practice with selection (***if***) and repetition (***for***, ***while***) in Python.

The ***if*** statement is used to choose between alternatives. The ***for*** and ***while*** statements are used to repeatedly execute blocks of statements.

The ***for*** statement is most useful when you know exactly how many times you want to repeatedly do something (for example, you know how many sides of a polygon you want to draw). Here is an example showing how to print something **n** times:

```
n = 4
for i in range(n):
   print("Hi!")
```

Here is the corresponding output:

```
Hi!
Hi!
Hi!
Hi!
```

The ***while*** statement is most useful when you don't know in advance how many times the program will be required to repeat a task (for example, prompting the user to enter a value until correct input is provided). Here we will use ***while*** to repeat a fixed number of times simply to practice using the statement. To compare with the previous example, we will print something **n** times:

```
n = 4
count = 0
while count < n:
   print("Hi!")
   count = count + 1
```

Here is the corresponding output:

```
Hi!
Hi!
Hi!
Hi!
```

In this example, note that you must manage the counter variable ("count") yourself. If you make a mistake with the counter management, the loop may end up repeating forever. In that case, in the upper right of the IPython shell window is an icon with two choices, "Interrupt Kernel" and "Restart Kernel". Try "Interrupt Kernel" first and if that doesn't work, "Restart Kernel" will.

Assignment Overview
Download the file "`lab02.py`" from the course website and develop a Python program which inputs a series of integers and processes them. The program will:

a) Continue to process values until the user enters the value 0
b) Ignore all negative integers
c) Count the number of odd integers entered
d) Count the number of even integers entered
e) Calculate the sum of the odd integers in the series
f) Calculate the sum of the even integers in the series
g) Display the sum of odds
h) Display the sum of evens
i) Display the count of odds
j) Display the count of evens
k) Display the total number of positive integers entered
l) Optional: print a message whenever a negative integer is entered

Sample output:

```
:~Input an integer (0 terminates)~: 1
:~Input an integer (0 terminates)~: 3
:~Input an integer (0 terminates)~: -2
:~Input an integer (0 terminates)~: 2
:~Input an integer (0 terminates)~: 6
:~Input an integer (0 terminates)~: 5
:~Input an integer (0 terminates)~: 0

sum of odds: 9
sum of evens: 8
odd count: 3
even count: 2
total positive int count: 5
```

Commentary

a) A nice characteristic of this problem is that it can be developed in small pieces. Remember: always try to break a problem into smaller pieces that are easier to solve.

b) First write a program that prompts for an integer, displays the integer, and stops asking for more integers when 0 is entered. Use ***while***. Under what condition do you continue to loop? Here is a suggested outline:

```
prompt for an integer  # (and convert the string to an int)
while some_Boolean_condition:
    # do something
    prompt for another integer
```

c) Once that simple program is tested and working, add in another piece such as (c) to count the number of odd integers entered. Create a variable with an appropriate name, such as `odd_count`, and assign it an initial value of 0 (before the while loop). When an odd number is entered, add one to `odd_count` (for example, `odd_count += 1`). Display the count.

d) Next: count the number of even integers and display the count.

e) Next: calculate the sum of the odd integers. The approach is similar to counting: choose a variable name, initialize it to 0; when the integer is odd, add the integer to the variable. Display the sum.

f) Next: calculate the sum of the even integers and display the sum.

g) Finally, ignore all negative numbers which the user inputs. One approach: *if* the integer is positive, do all the counting and summing, e*lse* do nothing (that is, you can use an *if* statement without an *else* clause).

h) If you have time, try this: print a message if the integer is negative.

★ **You should submit the completed program (named "lab02.py") for grading via the Codio system. You can also copy and paste your code into the coding window.**

Note (from the syllabus): Labs are credit/no-credit. To receive credit for a lab

1. You must complete the Pre-Lab, before your lab or the pre-lab deadline, whichever comes first. Pre-labs are "warm-up" for the labs and are not expected to be perfect -- our expectation is necessarily fuzzy for pre-labs: "you are expected to get most of them correct most of the time."
2. When Codio tests exist, they test perfection. The tests allow you to verify that your code is correct. However, you can get credit for correct Lab code that isn't perfect, i.e. it is possible to get credit for code that fails some automatic tests. (Note that Projects are stricter with respect to Codio tests.)