

CSE 1321L: Programming and Problem Solving I Lab

Assignment 1

Module 1

What students will learn

- o Problem Solving.
- o Terminology.
- o Basic Program Structure.
- o Input and Output with the user.
- o Basic calculations and calculations that require an intermediate solution.

Content

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- o Assignment1A: Alert
- o Assignment1B: Ideal Gas Law Calculator
- o Assignment1C: Centimeters to feet and inches

Overview:

For most of you, this will be the first time you have done any programming, which is exciting! The write-up of this first assignment will be a little longer than the others because we want you to understand how things are going to roll out the rest of the semester. Advice: Start early (certainly not the day the assignment is due), practice, and ask a lot of questions.

Unless calculations are trivial, you will almost always want to use an intermediate variable – where you store part of the solution. For example, you might remember the equation for gravity as:

$$F = G \frac{m_1 \times m_2}{R^2}$$

How would you write this as code? You might solve it in parts instead of one shot because it makes it easier to check. It would look like:

```
Temp1 = m1 * m2
Temp2 = r * r
Temp3 = temp1 / temp2
F1 = g * temp3
```

This is assuming the variables *m1*, *m2*, and *g* declared previously in the code.

Final note: **Do not cheat**

If your temptation is to look online, don't. Come see us instead and ask questions – we are here to help. Remember, you are going to have to write codes in your future job interviews, so learn it now to secure a high-paying job later.

Assignment1A: Alert

Let's imagine we are a developer of the website for the Postal Service of an imaginary country. We are tasked with updating the alerts banner for the homepage for the Postal Service, so the users may be able to know of upcoming situations that may disrupt service. Alerts such as holiday slowdowns, website maintenance, disruption of service due to geological phenomena, etc.

For this assignment, you will write a program that uses concatenation to output a line of Hyper-Text Markup Language (HTML) with a custom alert message.

Do not worry about the HTML part, you can just follow the template provided below:

```
<div class="g-alert"><p>ENTER YOUR ALERT HERE</p></div>
```

For this assignment:

- o Prompt the user to an alert message and read the input.
- o Output the line of HTML with the user's input concatenated into the line.

Below are two example runs. The user input is shown in **red and bold** (notice the dollar sign is not part of the user input).

Sample Output #1:

[HTML Alert Generator]

Enter the alert message:

Alert: Due to routine maintenance, some of our services may be unavailable on January 19th between 7 AM and 12 PM ET.

This is the custom HTML Alert:

```
<div class="g-alert"><p>Alert: Due to routine maintenance, some of our services may be unavailable on January 19th between 7 AM and 12 PM ET.</p></div>
```

Assignment1B: Ideal Gas Law Calculator

For this assignment, we will create a python program that will calculate the pressure of gas using the Ideal Gas Law equation. To calculate the pressure here is the equation you will implement in your program:

$$P = \frac{nRT}{V}$$

Where:

- o P: Pressure (in atm)
- o n: Number of moles of the gas (in moles)
- o R: Ideal gas constant $R = 0.0821 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}}$
- o T: Temperature (in Kelvin)
- o V: Volume (in Liters)

In Python, we do not have a way to declare constant variables. However, there is a naming convention that signifies a variable should be treated as a constant. We can do so by naming the variable in all uppercase like so:

```
PI = 3.14 #pi constant
```

Make sure for this assignment your program declares the Ideal Gas Constant as a constant by following this naming convention.

For this assignment:

- o Prompt and read from the user the input values for the required values to calculate Pressure in ATM:
 - o Number of moles of the gas.
 - o The temperature in Celsius.
 - o The volume in Liters.
- o Make sure to read these three inputs as **floats**.
- o Create a constant variable for the Ideal Gas Constant.
- o Convert the temperature in Celsius to Kelvin. Use this formula:
$$T.Kelvin = T.Celsius + 273.15$$
- o Use the user input values and the Ideal Gas Constant (R) to calculate the pressure.
- o Output the pressure calculated in atm rounded to **2 decimal places**.

Example runs are shown below. The user input is shown in **red and bold**.

Sample Output #1:

```
[Ideal Gas Law Calculator]
Enter the number of moles of the gas: .785
Enter the temperature of the gas in Celsius: 27.85
Enter the volume of the gas in Liters: 13
```

The pressure of the gas is 1.49 atm

Sample Output #2:

```
[Ideal Gas Law Calculator]
Enter the number of moles of the gas: 5.856
```

Enter the temperature of the gas in Celsius: **105**

Enter the volume of the gas in Liters: **2.5**

The pressure of the gas is 72.72 atm

Assignment1C: Centimeters to feet and inches

For this assignment, you will create a Python program that converts a length given in Centimeters into feet and inches. These are some of the conversions you should use in your solution:

$$1 \text{ ft} = 30.48 \text{ cm}$$

$$1 \text{ in} = 2.54 \text{ cm}$$

$$1 \text{ ft} = 12 \text{ in}$$

For this assignment:

- o The program should prompt and read for the value in centimeters to convert.
- o Make sure to read this as a **float**.
- o Then, use the provided conversions to calculate the conversion in feet and inches.
- o You may use whichever approach fits your solution, but you must program the conversions manually.
- o Finally, output the values in feet and inches. Make sure to round the inches values to 2 decimal places.

Note:

- o Remember that the output should be in feet and inches, do not just calculate the conversion for each unit and output it.
- o Moreover, you must solve this by applying the concepts that we have covered.
- o Hint: For your solution, you may have to use integer conversion or truncation to “separate” the whole portion of a decimal number by using `int(someValue)`, floor division (`//`), and modulus (`%`) to calculate remainder.

Example runs are shown below. The user input is shown in **red and bold**.

Sample Output #1:

[Centimeters to Feet and Inches Converter]

Enter the length in centimeters: **38**

The length is 1 feet and 2.96 inches

Sample Output 2:

[Centimeters to Feet and Inches Converter]

Enter the length in centimeters: **205**

The length is 6 feet and 8.71 inches

Submission Instructions:

- o Programs must follow the output format provided. This includes each blank line, colons (:), and other symbols.
- o Programs must be working correctly.
- o Programs must be written in Python.
- o Programs must be submitted with the correct **.py** format.
- o Programs must be saved in files with the correct file name:
 - Assignment1A.py

- Assignment1B.py
- Assignment1C.py
- o Programs (source code files) must be uploaded to Gradescope by the due date.