Assignment 2

Advanced branching and looping

Submit a single zip file called **assignment2.zip**. This assignment has 30 marks. See the marking rubric that is posted on the course webpage (also includes test cases). Sample outputs for each question are included at the end of this document.

Problem 1 (Car Stop/Go)

For this question, you will write two programs that determine if a car should go through an intersection or stop. Your program will prompt the user for the colour of the traffic light at the intersection (a string), the distance to the intersection in meters (a float), and the speed of the car in meters per second (a float). The following rules should govern the car's decision:

1. "Go" when the light is "green"
2. When the light is "yellow", "Go" if the car can reach the intersection within 5 seconds. Otherwise, the car must "Stop"
3. When the light is "red", "Go" if the car can reach the intersection in 2 seconds. Otherwise, the car must "Stop"
4. If the light is any color other than "green", "red", or "yellow", the car must "Stop"

a) Write a program that prints out the proper command ("Go" or "Stop") based on the given inputs using **only nested if and else statements (i.e., do not use elif, and, or, not, etc.)**. For example, your program should have a structure similar to:

```
if boolean_statement1:
      if boolean_statement2:
            #code block 2a
      else:
            #code block 2b
else:
      if boolean_statement3:
            #code block 3a
      else:
            #code block 3b
```

b) Write a program that prints out the proper command ("Go" or "Stop") based on the given inputs using a **single if/else statement with compound Boolean expressions**. In this case, your program must have a structure like:

```
if compound_boolean_statement:
      #code block 1
else:
      #code block 2
```

Save your two programs as **a2q1a.py** and **a2q1b.py** respectively and add each to your submission zip file.

Problem 2 (Factorial Calculation)

Write a program that calculates the factorial value of a number entered by the user. Remember that x! = x * (x-1) * (x-2) * ... * 3 * 2 * 1. Your program should check the value input by the user to ensure it is valid (i.e., that it is a number >= 1). To do this, consider looking at the isdigit() function available in Python. If the user enters an incorrect input, your program should continue to ask them to enter a proper value until they do so, at which point the program can calculate the factorial and print out the result.

Note: You must do the calculation manually – you cannot use a built-in factorial function.

Save your Python program in a file called **a2q2.py** and add it to your submission zip file.

Problem 3 (Tracking Numbers)

Write a program that reads in numbers from the user. Your program should be capable of tracking/calculating the minimum, maximum, total sum, and average of the numbers entered. When the user enters "q", "Q", or "quit", the program should display the minimum, maximum, total sum, and average of the numbers entered before ending. You can assume that the user will always enter either a number or one of the strings "q", "Q", or "quit". You can also assume the user will always enter at least one number (i.e., they will not immediately choose to quit upon starting the program).

Save your Python program in a file called **a2q3.py** and add it to your submission zip file.

Recap

Your zip file should contain your **a2q1a.py**, **a2q1b.py**, **a2q2.py**, and **a2q3.py** files.
Submit your **assignment2.zip** file to cuLearn.
Make sure you download the zip after submitting and verify the file contents.

Sample Results for Each Question

Question #1

What color is the traffic light? green
How fast is the car going? 0.5
How far to the intersection? 10
The car should go.

What color is the traffic light? orange
How fast is the car going? 5.5
How far to the intersection? 1
The car should stop.

What color is the traffic light? yellow
How fast is the car going? 5
How far to the intersection? 27
The car should stop.

What color is the traffic light? yellow
How fast is the car going? 4.5
How far to the intersection? 14
The car should go.

Question #2

Enter a number you want the factorial of: 5
The factorial of 5 is 120

Enter a number you want the factorial of: lala
Invalid input.
Enter a number you want the factorial of: -5
Invalid input.
Enter a number you want the factorial of: 3
The factorial of 3 is 6

Enter a number you want the factorial of: 120
The factorial of 120 is
66895029134491270575881180540903725867527463331380298102956713523016335572449
62989366874165271984981308157637893214090552534408589408121859898481114389650
00596496052125696000000000000000000000000000000000

Question #3

Enter a number (q, Q, or quit to exit): 15
Enter a number (q, Q, or quit to exit): 10
Enter a number (q, Q, or quit to exit): 25
Enter a number (q, Q, or quit to exit): 5
Enter a number (q, Q, or quit to exit): 0
Enter a number (q, Q, or quit to exit): 30
Enter a number (q, Q, or quit to exit): q
Min = 0
Max = 30
Total = 85
Average = 14.166666666666666

Enter a number (q, Q, or quit to exit): -57
Enter a number (q, Q, or quit to exit): quit
Min = -57
Max = -57
Total = -57
Average = -57.0

Enter a number (q, Q, or quit to exit): 0
Enter a number (q, Q, or quit to exit): 2
Enter a number (q, Q, or quit to exit): 4
Enter a number (q, Q, or quit to exit): 6
Enter a number (q, Q, or quit to exit): 8
Enter a number (q, Q, or quit to exit): 10
Enter a number (q, Q, or quit to exit): Q
Min = 0
Max = 10
Total = 30
Average = 5.0

Enter a number (q, Q, or quit to exit): -100
Enter a number (q, Q, or quit to exit): 100
Enter a number (q, Q, or quit to exit): 37
Enter a number (q, Q, or quit to exit): -256
Enter a number (q, Q, or quit to exit): 1024
Enter a number (q, Q, or quit to exit): 9

Enter a number (q, Q, or quit to exit): 93
Enter a number (q, Q, or quit to exit): 93
Enter a number (q, Q, or quit to exit): 16
Enter a number (q, Q, or quit to exit): quit
Min = -256
Max = 1024
Total = 1016
Average = 112.88888888888889