EECE 230X – Introduction to Computation and Programming
Programming Assignment 1

- This programming assignment consists of 4 problems.
- Prerequisites:
  - Problems 1,2,3: Topics 1 and 2
  - Problem 4: Topic 3 up to Lesson 3
- Related material: Objects and Types, Operators, Expressions, Variables and Assignment, Strings, Input/Output, Modules, and Selection

Problem 1. Bill

A group of friends would like to share a restaurant bill. The bill includes two items: food and drinks. The friends would also like to add a 15% tip to the total for the excellent service they received. Write a Python script that performs the following:

1. Prompt the user to enter the price of food and drinks and store them in variables. Assume the values entered by the user are positive integers representing the price in the currency of your choice, which will be referred to as pound in this problem.
2. Prompt the user to enter the number of friends and store it a variable. Assume this value is a positive integer.
3. Compute the values of following quantities and stores them in variables: the total before tip, the tip, and the total after including the tip.
4. Compute the share for each friend after rounding it up to the next multiple of one pound. To round up, use the `ceil` function in the `math` module: check the `math` docs link in Topic 2.
5. Print the rounded share

Sample Input/Output:

```
Enter price of food: 275

Enter price of drinks: 28

Enter number of people: 4
Share =  88 pounds
```

Problem 2. Time

Write a Python script which asks the user to enter the elapsed time in seconds. Your program should then convert the time into hours, minutes, and seconds, and display the results as `hours:minutes:seconds`.
(*Hints:*

- ⋆ Use a variable for hours, a variable for minutes, and a variable for seconds.
- ⋆ Use the modulo (%) and integer division (//) operators)

Sample Input/Output:

```
Enter elapsed time in seconds: 3607
Converted time:  1 : 0 : 7
```

Problem 3. Wheels on the bus

Consider the beginning of the Wheels on the Bus song:

```
The wheels on the bus go round and round,
round and round,
round and round,
The wheels on the bus go round and round,
all through the town.
```

Write a "short" Python script which first stores the above text in a string s and then prints s. Your code should take advantage of the the repetitive structure in the text. In particular, the size of your code should be around half that of the text. Use concatenation $(+)$ and repetition $(*)$ operators for strings.

(*Hint:* store repeated substrings in variables.)

Problem 4. Quadratic equations solver

Write a Python script which first asks the user to enter three floats a, b and c, where $a \neq 0$. Your program should solve for the real roots of the quadratic equation $ax^2 + bx + c = 0$.

Recall that we have three cases depending on the sign of the discriminant $\Delta = b^2 - 4ac$. If $\Delta > 0$, then the equation has two distinct roots: $\frac{-b \pm \sqrt{\Delta}}{2a}$. If $\Delta = 0$, then the equation has one root: $-\frac{b}{2a}$. If $\Delta < 0$, then the equation has no real roots. Assume that $a \neq 0$.

(*Hints:*

- Use the `if-elif-else` selection structure to distinguish between the three cases
- Use power operator `**` to compute the square root.
- To check if $\Delta = 0$, check if its absolute value is less than a small number such as 10^{-9}.)

Sample Input/Output:

```
Enter a (nonzero):1.3

Enter b:2.1

Enter c:-15.7
The equation has two roots: 2.7601207396559415  and  -4.3755053550405565

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Enter a (nonzero):1

Enter b:2

Enter c:1
The equation has one root: -1.0

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Enter a (nonzero):1

Enter b:2

Enter c:3
The equation has no  roots
```