NYU, Polytechnic School of Engineering
CS-UY 1114 Introduction to Programming and Problem Solving — Fall 2015

**Homework #3**
**Due by Monday, 10/5, 11:55pm**

**Submission instructions:**

1. You should submit your homework in the NYU Classes system.

2. For this assignment you should turn in 4 or 5 '.py' files, each containing a script for each question. Name your files 'hw3q1.py','hw3q2.py', etc.

**Question 1:**

Textbook Page 144, Q4.

In an earlier set of exercises (Textbook Page 79, Q34, or Homework 2, Q1), you were asked to calculate one's BMI. Augment that program by print out where that BMI fits in the CDC standard weight status categories:

| BMI | Weight Status |
|---|---|
| Below 18.5 | Underweight |
| 18.5–24.9 | Normal |
| 25.0–29.9 | Overweight |
| 30.0 and above | Obese |

**Question 2:**

Write a program that computes how much a customer has to pay after purchasing two items. The price is calculated according to the following rules:

- Buy one get one half off promotion: the lower price item is half price.
- If the customer is club card member, additional 10% off.
- Tax is added.

Inputs to the program include:

- Two items' prices
- Have club card or not (User enters 'Y' or 'y' for "yes"; 'N' or 'n' for "no")
- Tax rate (User enters the percentage as a number; for example they enter 8.25 if the tax rate is 8.25%)

Program displays:

- Base price - the price before the discounts and taxes

- Price after discounts - the price after the buy one get one half off promotion and the member's discount, if applicable
- Total price – the amount of money the customer has to pay (after tax) printed with precision of at most 2 decimal digits.

Hint: In order to print a number in a specific precision, you can use the `round` function passing 2 arguments to it. Use `help(round)` to get a brief explanation of this function, and try playing with it, to better understand what it does.

For example, an execution could look like this:
Enter price of first item: 10
Enter price of second item: 20
Does customer have a club card? (Y/N): y
Enter tax rate, e.g. 5.5 for 5.5% tax: 8.25
Base price = 30
Price after discounts = 22.5
Total price = 24.36

## Question 3:
Write a program that does the following:
- Ask user to input three floating point numbers a, b and c. They are the parameters of a quadratic equation $ax^2 + bx + c = 0$
- Classify to one of the following:
  o 'Infinite number of solutions' (for example, $0x^2 + 0x + 0 = 0$ has infinite number of solutions)
  o 'No solution' (for example, $0x^2 + 0x + 4 = 0$ has no solution)
  o 'No real solution' (for example, $x^2 + 4 = 0$ has no real solutions)
  o 'One real solution'
  o 'Two real solutions'
- In cases there are 1 or 2 real solutions, also print the solutions.

Hint: if $a \neq 0$ and there are real solutions to the equation, you can get these solutions using the following formula:
$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
The number of solutions depends on whether $(b^2 - 4ac)$ is positive, zero, or negative.

For example, an execution could look like:
Please enter value of a: 1
Please enter value of b: 4
Please enter value of c: 4
This equation has single real solution x=-2.0

**Question 4:**

Write a program that does the following:

- Ask user to input lengths of three sides. (You may assume that these inputs are really the sides of a triangle.)
- Classify it into one of the following:
  - Equilateral triangle
  - Isosceles right triangle
  - Isosceles triangle that is not a right triangle
  - A triangle that is not an isosceles and not an equilateral

For example, an execution could look like:

Please enter lengths of a triangle's sides
Length of the first side: 30
Length of the second side: 30
Length of the third side: 30
30, 30, 30 form an equilateral triangle.

**Extra credit:**
**Question 5:**

Extend Question 4, by also drawing the triangle using Turtle Graphics. Your program should work with any set of inputs, which means no hardwiring of lengths or angles.

Hint: Use the law of cosines (https://en.wikipedia.org/wiki/Law_of_cosines)