# Assignment 1

*due Thursday 10 October*

Complete all of the following tasks by the date indicated above. I will collect and grade one of these. I will reveal which one to submit the day before the due date i.e. Wednesday 9 October.

1. Write a Python program to compute the area of a triangle given the length of its three sides based on the following formula:

   $$\text{area} = \sqrt{s \times (s - s_1) \times (s - s_2) \times (s - s_3)}$$

   where $s_1, s_2, s_3$ are the three side lengths and $s = (s_1 + s_2 + s_3)/2$. You may use the exponentiation operator $**$ to calculate the square root e.g. $2 ** 0.5$ gives the square root of two.

2. Write a Python program that asks the user to enter a non-negative integer and that outputs the factorial of that number. Recall that the factorial of $n$ (denoted $n!$) is defined as follows:

   $$n! = n \cdot (n-1) \cdot (n-2) \cdots 3 \cdot 2 \cdot 1$$

   Do not use the `math.factorial` function.

3. A quadratic function has the form $f(x) = ax^2 + bx + c$, where $a$, $b$ and $c$ are constants and $a$ is nonzero. The real roots of this equation can be found using the formula

   $$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

   If the square root is zero the equation has a single root and if it is negative the equation has no roots. Write a program that computes the real roots of a quadratic function. Your program should begin by prompting the user for the values of $a$, $b$ and $c$. Then it should display a message indicating how many roots it has along with the values of those roots (if any).

4. Write a Python program that requsts the user to enter a real number $x$ and that calculates and prints an approximation of the quantity $e^x$ based on the first hundred terms of the infinite sum

   $$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!}$$

   Recall that $k!$ denotes the factorial of $k$. Do not use the `math.factorial` function. Hint: It should not be necessary to compute ecah term in the sum from scratch.

Each file should contain a comment that contains a succinct description of what the program does. It should also include your name and id number. Ensure also that you choose meaningful names for any variables you use.