

The American University in Cairo
Computer Science & Engineering Department
CSCE 106/1001 – Fundamentals of Computer Science

Lab Session 3

Arithmetic Expressions & Operations

Objectives:

- To become more familiar with the **algorithmic** method of problem solving.
- To become more familiar with using **Flow Chart** to represent solution for a problem.
- To understand how to write assignment statements to change the values of variables.
- To learn how C++ evaluates arithmetic expressions and how to write them.
- To learn how to use the standard mathematical library **<cmath>**.
- To understand the differences between syntax errors, run-time errors, and logic errors and how to avoid them and to correct them.

Problems:

Draw a Flow Chart and Write a C++ program to solve each of the following problems:

1. Given a, b, and c, compute and display R1 and R2 (rounded to the nearest hundredth) according to the following formulas:

$$R1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{and} \quad R2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

(hint: To test your solution; choose input values such that **a** not equal to zero and **b² - 4ac** not negative)

2. Given a positive number, print its square and square root rounded to the nearest tenth.
3. Given the depth (in kilometers) inside the earth; compute and display the temperature at that depth in degrees Celsius and Fahrenheit. The relevant formulas are:

Celsius = 10 x (depth) + 20 (Celsius temperature at depth in km)

Fahrenheit = 1.8 x (Celsius) + 32

4. The Pythagorean Theorem states that the sum of the squares of the sides of a right triangle is equal to the square of the hypotenuse. For example, if two sides of a right triangle have lengths 3 and 4, then the hypotenuse must have a length of 5. The integers 3, 4, and 5 together form a Pythagorean triple. There is an infinite number of such triples. Given two positive integers, m and n, where m > n, a Pythagorean triple can be generated by the following formulas.

$$\text{Side1} = m^2 - n^2$$

$$\text{Side2} = 2mn$$

$$\text{Hypotenuse} = \sqrt{\text{Side1}^2 + \text{Side2}^2}$$

Write a program that reads in values for m and n and prints the values of the Pythagorean triple generated by the formulas above.

Instructions:

- The TA solves problem 1 (**20 minutes**)
- The TA asks students to solve and **submit in-Lab** problem 2 (**40 minutes**)
- The TA asks students to solve the other problems and **submit within three working days**.