Degree in Software Engineering – Computing Basics

Unit 2.3 Exercises: Input/Output

This document includes a collection of exercises from Unit 2.3: Input/Output. It is recommended that you try doing the exercises without looking at the solutions first, and then you check your answers.

Exercise 1

The equations of constant acceleration motion enable the calculation of an object's position with respect to its velocity and acceleration. In particular, the uniformly accelerated rectilinear motion (UARM) statement is that "*a body moves with UARM when its trajectory is a straight line and its acceleration is constant and different from 0.*" As a result, it is possible to calculate the position of an object after some time *t*, given its position x_0, velocity v_0, and acceleration *a* at a given instant in time.

Write a program in Python that takes the position of an object, its velocity and its acceleration as inputs, and prints the position of the object after some time, also requested as input. For this purpose, remember that the UARM equation is as follows:

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

Assume all input values introduced by the user are valid. Show the result as a decimal number using two decimal digits.

Example:

```
Initial position (m): 25
Initial velocity (m/s): -3.2
Acceleration (m/s^2): 2.35
Time (s): 10.5
The position of the object after 10.5s is 120.94m
```

Exercise 2

The Pythagorean Theorem stablishes the fundamental relationship between each cathetus of a right triangle, *a* and *b*, and its hypotenuse, *c*, so that the following equation applies:

$$a^2 + b^2 = c^2$$

Write a program in Python that takes the length of both catheti and prints the length of the hypotenuse using two decimal digits. Assume all input values introduced by the user are valid.

Example:

```
Length of first cathetus: 3.15
Length of second cathetus: 8.9
The length of the hypotenuse is 9.44
```

Exercise 3

Write a program in Python that takes one integer value as input, and prints its binary representation and its hexadecimal representation. Assume all input values introduced by the user are valid.

Hint: you can use the `bin()` and `hex()` functions in Python to convert one `int` value to its binary and hexadecimal representations, respectively. Alternatively, you can also search for replacement symbols used in the `.format()` function to print `int` values as binary or hexadecimal.

Example:

```
Input an integer number: 432
432's binary representation is 0b110110000
432's hexadecimal representation is 0x1b0
```

Exercise 4

Write a program in Python that takes three input values, x_1, x_2 and x_3, and prints the average and the standard deviation of the population. Remember that these can be calculated as follows:

$$\mu = \frac{\sum_{i=1}^{N} x_i}{N}$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^{N} (x_i - \mu)^2}{N}}$$

where N is the size of the population (3, in this case), μ is the average, and σ is the standard deviation of the population.

Assume all input values introduced by the user are valid. Show the results as decimal numbers using two decimal digits.

Example:

```
Input the first value: 4.2
Input the second value: 9.75
Input the third value: 3.22
The average is 5.72 and the standard deviation is 2.88
```