UML Class Diagram

<https://csci-1301.github.io/about#authors>

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Quoting [wikipedia](https://en.wikipedia.org/wiki/Unified_Modeling_Language),

The Unified Modeling Language (UML) is a general-purpose, developmental, modeling language in the field of software engineering that is intended to provide a standard way to visualize the design of a system.

Stated differently, it is a tool for visually representing programs and their deployment. UML uses many different types of diagrams to represent different aspects of systems and software. In this lab you will practice interpreting and creating one of them: a *class diagram*.

# Interpreting a UML class diagram

## Reading the diagram

Study the following diagram, then answer follow up questions:

|===========================================|  
| Account |  
|-------------------------------------------|  
| - balance : decimal |  
|-------------------------------------------|  
| + GetBalance():decimal |  
| + DisplayBalance():void |  
| + AddFunds(amount:decimal):void |  
| + Withdraw(amount:decimal):void |  
|===========================================|

1. What is the name of this class?
2. How many attributes does this class have?
3. What is the data type of balance?
4. How many methods does this class have?
5. What is the significance of + and - in the diagram?
6. You will notice that there are two similar methods: GetBalance and DisplayBalance
   * based on the name can you interpret the behavior of these methods?
   * can you think of *why* we might need two such similar methods?

## Implementing the class

Class diagram provides a concise way to represent attributes and methods, but it does not explain the implementation of the methods.

Knowing that:

1. GetBalance returns the current value of balance,
2. DisplayBalance displays the current balance at the screen formatted as currency,

* for example:
* Your current balance is $1,000,000.00 dollars!

1. AddFunds increments the current balance value by specified amount, and
2. Withdraw reduces balance by specified amount.

implement your version of this class in C#. For completeness, after you are done you should instantiate an object of the class and ensure it works as described.

# Creating your own class diagram

In this next exercise you will practice drawing your own diagram, on paper.

1. Draw the UML class diagram of a Rectangle class.
2. It should have two attributes: width and length of type int
3. It should have eight methods:
   * two setters, two getters (i.e., one for each attribute)
   * ComputeArea method to compute the area of a precise rectangle
   * ComputePerimeter method to compute the perimeter of a precise rectangle
   * Swap method to swap the length and the width of a precise rectangle
   * Multiply method to multiply the length *and* width of a precise rectangle by an ratio given in argument as an integer (int).

You can check your answer, by referring back to the Rectangle.cs file from the [“Enriched Rectangle” project](labs/ClassDiagram/../Rectangle/Enriched_Rectangle.zip). The UML diagram for this class is indicated, in comments, at the beginning of the file (but misses the Multiply method).

# Pushing Further (Optional)

The following is an independent task, to widen your understanding of UML modelling concepts:

1. Class diagrams are just a special case of UML diagram. Have a look at <https://en.wikipedia.org/wiki/Unified_Modeling_Language#Diagrams>. In which category are class diagrams: behavior, or structure diagram?
2. Besides modelling attributes and methods, class diagrams can also represent relationships between classes. Have a look at <https://en.wikipedia.org/wiki/Class_diagram> for more examples of class diagrams and its uses.
3. Activity Diagram is another type of UML diagram for representing program actions. You will occasionally see activity diagrams in the lecture notes. Have a look at <https://en.wikipedia.org/wiki/Activity_diagram> and try to understand the example: “Activity diagram for a guided brainstorming process”.s